J. Nelson

January 18, 2000

Mr. Stephen W. Verigin, Chief
Division of Safety of Dams
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001

Dear Mr. Verigin:

Subject: Leroy Anderson Dam, No 72-9, Santa Clara County
1998-1999 Summary Report and Analysis of Surveillance Data

Enclosed with this letter are two copies of our 1998-1999 summary report for Anderson covering the period from 1993 through December 1999. This report includes an analysis of data from 2 pneumatic piezometers, spillway underdrain flow, 16 dam crest survey monuments, and 3 spillway training wall survey monuments.

The trends of the data from piezometric levels and survey monuments are acceptable for the period of this report, and are consistent with those previously observed and reported to DSOD. There are no adverse or unexpected trends in the instrumentation surveillance data. Visual observations of the dam and appurtenant structures indicate generally satisfactory conditions. Significant maintenance activities are summarized in the report.

If you have any questions or comments, please contact Mr. James L. Nelson (408) 265-2607, extension 2667, or Mr. Mohammad Khan at extension 2734.

Sincerely

Original Signed By

James C. Wang, Ph.D., P.E.
Hydrology and Geology Services
Engineering Unit Manager

Enclosures

Cc w/encl. J. Wang, J. Sutcliffe, R. Fields, G. Faler, S. Choy, J Aguilera, M. Khan, K. Reiller, J. Mueller, J. Nelson, File.

January 18, 2000

Mr. Stephen W. Verigin, Chief
Division of Safety of Dams
Department of Water Resources
P.O. Box 942836
Sacramento CA 94236-0001

Subject: Leroy Anderson Dam, No. 72-9 - Santa Clara County

1998-1999 SUMMARY REPORT AND ANALYSIS OF SURVEILLANCE DATA

- Piezometer and Monthly Rainfall Data from January 1993 through December 1999
- Monument Data from January 1993 through December 1999
- Spillway Underdrain Flow Data from May 1993 through December 1998

INTRODUCTION

This 1998-1999 annual summary report for the period outlined above provides an analysis of data from Leroy Anderson Dam, No. 72-9. During this time, the Santa Clara Valley Water District (District) monitored 2 pneumatic piezometers, spillway underdrain flow, 16 dam crest survey monuments, and 3 spillway training wall survey monuments. This report presents our interpretation and evaluation of surveillance data and field observations. The assessments and conclusions are based on our professional judgement.

In this report all crest monument and spillway training wall monument data are presented using a new horizontal datum. The old horizontal datum used in previous reports was based on North American Datum 1927, with distances measured relative to X and Y axes established along the dam crest. The new datum used in this report is based on the California Coordinate (Northings and Eastings) system of North America Datum (NAD) 1983. All future reports will be based on this new datum. As a result, instead of reporting monument locations at "X" and "Y" coordinates (Table 4) as was done previously, all data for this and future reports will be reported as "Northings" and "Eastings" (Table 5). In addition, we have calculated the resultant vector of the Northings and Eastings readings and have included them in Table 5. Vertical data (formerly referred to as "Z") is now included in Table 5 instead of Table 4.

Figure 1 shows the location of the surveillance points discussed below. Figure 2 shows both piezometers in cross section. Table 1 summarizes pertinent dam design data. Table 2 summarizes January 1993 through December 1999 piezometer and monthly rainfall data, Table 3 summarizes May 1993 to December 1998 spillway underdrain flow data, Table 4 summarizes January 1993 through December 1998 former monument survey X and Y data, and Table 5 summarizes January 1993 through December 1999 monument survey Vertical, Northing, Easting, and resultant vector displacement data.

Piezometers are read monthly and the crest monuments are surveyed annually. Seepage at the spillway underdrain discharge point is measured seasonally as it occurs. Reported rainfall is measured at District Rain Gauge No. 41-2073, located a few hundred feet southeast of the left abutment of Leroy Anderson Dam.

SUMMARY OF FOUNDATION AND EMBANKMENT CONDITIONS

Information in this section is based on Wahler Associates' 1986 Inspection and Safety Review report of Leroy Anderson Dam, prepared in accordance with requirements of the Federal Energy Regulatory Commission.

Foundation earth materials beneath the dam are rocks of the Jurassic-Cretaceous Franciscan Complex. Specifically, the lower right abutment is underlain by sandstone and shale, while the upper right abutment and upstream right abutment are underlain by soft, sheared serpentine. The serpentine extends from the upstream toe in the channel and cuts diagonally downstream across the right abutment. The serpentine/sandstone contact is characterized by a zone of crushed and faulted serpentine. Numerous faults mapped within the serpentine appear to be traces of the Coyote Creek fault system.

The dam embankment consists of a wide, central impervious core designated as Zones 2 and 3, flanked by upstream and downstream rockfill shells designated as Zones 1 and 4. Control of localized bedrock seepage from the foundation is provided by a rock drain (see Figure 2). The rock drain was constructed as a strip 20 to 30-foot-wide, about 130 feet long and up to about 20 feet thick on the foundation beneath Zone 3 on the left side of the channel section. The downstream end of the rock drain is connected to free draining rock of the downstream shell (Zone 4). It appears this drain may have been constructed to control seepage from several springs that were apparently encountered during construction.

PIEZOMETER DATA

Figure 3 shows piezometric levels, reservoir levels, and monthly rainfall data from January 1993 through December 1999. Reported rainfall is measured at District Rain Gauge No. 41-2073, located a few hundred feet southeast of the left abutment of Leroy Anderson Dam. Both pneumatic piezometers (PPA-1 and PPA-2) show slight fluctuations and response to changes in reservoir levels.

The 1998-1999 rainy season has been characterized as a "La Niña" event, with approximately normal rainfall for most of San Francisco Bay Area. In 1999, the piezometric elevation at PPA-1 ranged from 577.91 feet (August 1999) to 585.19 feet (June 1999) with corresponding reservoir levels of 616.55 feet (August 1999) and 622.06 feet (June 1999). At PPA-2, the piezometric elevation ranged from 501.33 feet (April and August 1999) to 505.02 feet (September 1999) with corresponding reservoir levels of 623.66 feet (April 1999), 616.55 feet (August 1999), and 610.80 feet (September 1999). The small change in piezometric elevation relative to larger reservoir level changes is probably due to the impervious nature of the core material.

There is an indication of a 5 to 6-month lag time between peak reservoir levels and subsequent piezometric highs. The lag time between reservoir lows and the subsequent piezometric lows appears to be about 1 to 2 months.

Although pneumatic piezometers PPA-1 and PPA-2 show only minor variations in piezometric elevations, these instruments appear to have provided reliable data during the entire surveillance period.

A review of the piezometric data indicates that the embankment and its foundation are performing satisfactorily with respect to pore pressure generation and stability.

MONUMENT DATA

Due to dam crest modifications in 1987 and 1988, the original 15 crest monuments were destroyed and 16 new crest monuments (Monuments 16 through 31) were established. In addition, three new monuments (Monuments 13, 14, and 15) were established on the right and left spillway training walls (Figure 1).

The following figures are new to these annual reports. Figures 5, 6, 7, and 8 show historic movement of the 15 original dam crest monuments from 1951 to 1987. Plots of transverse and vertical monument data of the original monuments are shown on Figures 5 and 6, respectively. Plots of selected original crest monument transverse location surveys in plan view and vertical location surveys in section view are shown on Figures 7 and 8, respectively.

In 1999, the monuments were surveyed on December 3. As previously mentioned, survey data is now based on the new 1983 datum (Northings and Eastings). Plots from reports prior to 1999 were based on the 1927 datum (X and Y axes).

Plan views of resultant vectors for total movement of downstream crest monuments, upstream crest monuments, and spillway training wall monuments are shown on Figures 9, 11, and 13, respectively. The large arrows show total movement since 1988. Figures 9, 11, and 13 can be used as overlays to Figures 10, 12, and 14, respectively, which are plan views of lateral monument displacement.

Lateral Displacement

The 15 original dam crest monuments monitored from 1951 to 1987 exhibited the following general trends with respect to lateral displacement (Figure 7). All of the monuments except those at the left and right abutments generally moved upstream (Figure 7). By 1965, maximum upstream movement of up to about 0.65 feet occurred near the left abutment. Lateral location surveys from 1965 to 1987 indicated minor upstream movement (less than 0.2 feet)

Since the dam raise in 1988, upstream and downstream crest monuments have been displaced downstream. During the last 11 years, maximum lateral displacement (as indicated by resultant vectors) was 0.29 foot in the downstream direction at Monument 21 (Figure 9). It should be noted that the lateral location survey plots shown on Figures 9 through 14 in this report are slightly different than equivalent plots presented in previous reports from 1995 through 1998. These minor differences are due to changing from the old horizontal datum (NAD 1927) to the new horizontal California Coordinate system (NAD 83) and using GPS survey techniques.

Based on the 1999 data, the general downstream movement of all dam crest monuments appears to have stabilized somewhat since the January 29, 1997 survey. During the period from January 1997 to December 1999, most of the monuments had moved downstream minor amounts; about 0.01 to 0.03 foot. Several monuments (16, 18, 20, and 27) do not appear to have moved since January 1997. The District will continue to monitor this trend.

Vertical Displacement

From 1951 to 1987 the 15original dam crest monuments have settled as much as about 3.4 feet (Figures 6 and 8).

The new crest monuments have exhibited gradual settlement of the embankment since Anderson Dam was raised in 1988. Maximum settlement of 0.35 foot has occurred at Monument 24 since 1988. Most of this settlement appears to be due to consolidation of the new fill placed to raise the dam. Only minor amount of settlement (as much as 0.06 foot) has occurred since May 1996.

Except for the observed downstream movement of crest monuments, displacements due to consolidation settlement and lateral movement have been within reasonable limits for an earth fill dam of this size. Historically, the dam exhibits typical long-term settlement behavior and has responded safely to seismic events. No other unusual trends are evident in the crest monument data.

SPILLWAY UNDERDRAIN FLOW DATA

Figure 4 shows spillway underdrain flow, reservoir levels, and monthly rainfall data from 1993 through 1998. During 1999, the District installed two weir structures that will collect underdrain flow from two main underdrain exit points. The former underdrain flow meter appeared to be measuring only about ½ to 1/3 of the total underdrain flow. Consequently, the weir structures were constructed to attempt to collect all or most of the underdrain flow. Beginning with the 1999-2000 season, the District will only report weir discharge rates and will no longer report underdrain flow meter data. Due to construction of the two underdrain seepage wiers, no spillway underdrain flow was recorded from the underdrain flowmeter during the current surveillance period.

A brief report by Wahler Associates dated May 25, 1993, concluded that spillway underdrain flows were well within the range of past drain or weep hole flows into the original spillway, and no safety related concerns exist because the spillway slab is well-drained with substantial anchorage into the underlying bedrock.

INCLINOMETER DATA

An active landslide upstream of the left abutment known as "Landslide B" is monitored by visual observation and by an inclinometer boring (SI-3, Figure 1). The inclinometer casing is only accessible when the reservoir water surface is below approximately elevation 576 feet (Figure 1)

Because the inclinometer boring has been submerged for the last several years the District has not been able to obtain inclinometer data from SI-3. Based on observations, it appears the landslide continues to move very slowly. When the reservoir levels are low enough to gain access to the inclinometer boring, we will obtain inclinometer data. The data will be included in future reports.

According to a log by former District geologist Jim Scott, the boring for SI-3 was advanced to a depth of 92 feet. The boring was logged as "slide mass material," which was described as having fragments and cobbles of serpentinite in a matrix of lean sandy clay from ground surface to the bottom of the boring.

An initial base-line inclinometer probe survey of SI-3 was performed on November 28, 1976 by consultants Shannon & Wilson, Inc. The latest inclinometer probe survey of SI-3 was performed by the District on August 30, 1989. Figure 18 shows resultant deflection plots of April 30, 1987, August 25, 1987, November 3, 1987, and August 30, 1989. We currently do not have access to the base-line data from November 1976. The base-line data used for the plots on Figure 18 is a November 7, 1985 survey. Consequently, resultant deflections shown represent movement since November 1985 and not 1976. Figure 18 also shows the "A+" direction and resultant directions as arrows. The A+ direction is the orientation of the "A-axis" or primary axis of two perpendicular inclinometer-casing grooves. The secondary axis is known as the "B-axis." The orientation of the A+ axis is S82^{O}W. The resultant deflection orientation was determined by directing Digipro software to "rotate" the inclinometer plots clockwise, until the maximum apparent deflection of the A-axis was achieved (left plot of Figure 18). For SI-3, the maximum apparent deflection was determined to occur when the plot was rotated 30 degrees clockwise. Therefore, the resultant direction of possible slope movement is N60^{O}W.

The plots in Figure 18 appear to indicate movement along a zone at a depth of about 25 feet below ground surface. Since November 1985, maximum apparent movement is about 2 inches.

VISUAL OBSERVATIONS

Throughout the year, District employees make visual observations during site visits for routine surveillance, operation and maintenance, or other activities. Inspections and observations that were performed during the period of this report include.

- An April 16, 1999, annual inspection by DSOD and District personnel.
- A December 27, 1999, field inspection by a District assistant engineering geologist and District geotechnical engineer inspected the dam. No conditions were noted that would affect the safe performance of the dam.

During the annual DSOD inspection on April 16, 1999, DSOD requested the following:

1. Clean all weep holes on spillway floor.
2. Monitor seepage occurring at base of the left spillway wall at station 2+75.
3. Fill last joint above the spillway bucket on the left side with an expandable sealer.
4. Monitor possible horizontal movement of the last panel of the spillway bucket on the left side. This panel appears to have moved slightly downstream, which may have contributed to opening of the joint mentioned in Item 3, above, and minor fractures observed in the concrete facing of the spillway bucket.

During a previous 1998 visit, DSOD identified three erosional areas in the plunge pool area that needed repair. In 1999, the District provided erosion protection of the plunge pool area by adding additional riprap. During their 1999 visit, DSOD requested that we continue to monitor possible future erosion in this area.

During the DSOD April 16, 1999, visit the District discussed the aspects of the proposed installation of the two "V" notch weirs at the end of the spillway bucket to measure spillway underdrain flow. In a previous section of this report we provide information on the construction of these weirs.

LOCAL SEISMICITY DURING JANUARY 1999 THROUGH DECEMBER 1999

A discussion of historic seismicity in the vicinity of Anderson Dam prior to 1998 is presented in our previous annual reports for the dam (1995; 1996; 1997; 1998; 1999). Seismic information was obtained from the U.S. Geological Survey National Strong-Motion Program Internet site (U.S.G.S., 1998) and the Northern California Earthquake Data Center Internet site (Northern California Earthquake Data Center, 1998).

Since the 1998 annual report (March 1999), there has not been any noteworthy earthquakes (defined here as M_L greater than about 4.0) or significant earthquakes (defined here as M_L greater than or equal to 5.0) within 50 miles of Anderson Dam. The last significant earthquake was the magnitude M_L 5.35 "San Juan Bautista" earthquake of August 12, 1998 that was approximately 30 miles southeast of the dam. A discussion of that earthquake was presented in the 1998 annual DSOD report of Anderson Dam.

CHANGES IN SURVEILLANCE PROGRAM, DAM AND APPURTENANT STRUCTURES, AND OPERATIONS AND MAINTENANCE

Overall, for the period January 1999 through December 1999, no significant modifications of the dam or appurtenant structures occurred, and no operational changes were made that would impact the surveillance data or its interpretation.

CONCLUSIONS

Although pneumatic piezometers PPA-1 and PPA-2 show only minor variations in piezometric elevations, these instruments appear to have provided reliable data during the entire surveillance period.

A review of the piezometric data indicates that the embankment and its foundation are performing satisfactorily with respect to pore pressure generation and stability. There has not been any significant increase in pore pressure in the dam core that would undermine the dam stability.

Since 1988, current maximum lateral displacement of the crest is about 0.29 foot downstream at Monument 21. The downstream displacement of crest monuments appears to have stabilized since January 1997. Current maximum settlement is 0.35 foot at Monument 24.

Displacements due to consolidation settlement and lateral movement have been within reasonable limits for an earth fill dam of this size. Historically, the dam exhibits typical long-term settlement behavior and has responded safely to seismic events. No other unusual trends are evident in the crest monument data.

Review of the surveillance data shows a normal response of the dam to its environment, aging process, and external events. The District will continue with the current monitoring program and will keep DSOD informed of any significant changes pertaining to the surveillance of Leroy Anderson Dam.

Report Prepared by:

Original Signed By:

James L. Nelson, C.E.G.
Assistant Engineering Geologist

Mohammad Khan, P.E.
Associate Civil Engineer (Geotechnical)

Attachments:

Table 1 – Pertinent Dam Statistics (As-built modifications, 1988)
Table 2 - 1993 through 1999 Piezometer and Monthly Rainfall Data
Table 3 – 1993 through 1998 Spillway Underdrain Flow Data
Table 4 – Former Monument Survey X and Y Direction Data
Table 5 – Monument Survey Vertical, Northings, Eastings, and Resultant Vector Displacement Data
Figure 1 - Topographic Map, Leroy Anderson Dam Surveillance Instrumentation
Figure 2 - Cross Section, Leroy Anderson Dam Piezometer Locations
Figure 3 - Reservoir, Piezometric Surfaces, and Monthly Rainfall, January 1993 through December 1999
Figure 4 - Reservoir Level, Spillway Underdrain Flow, and Monthly Rainfall, May 1993 through December 1998
Figure 5 - Original Crest Monument Transverse Displacement Versus Time, April 1951 through April 1987
Figure 6 - Original Crest Monument Vertical Displacement Versus Time, April 1951 through April 1987
Figure 7 - Selected Original Crest Monument Transverse Location Surveys in Plan View, January 1951 through June 1985
Figure 8 - Selected Original Crest Monument Vertical Location Surveys in Plan View, January 1951 through June 1985
Figure 9 - Relative Displacement Vectors of Downstream Crest Monument Lateral Location Surveys, July 1988 through December 1999
Figure 10 - Downstream Crest Monument Lateral Location Surveys in Plan View, July 1988 through December 1999
Figure 11 - Relative Displacement Vectors of Upstream Crest Monument Lateral Location Surveys, July 1988 through December 1999
Figure 12 - Upstream Crest Monument Lateral Location Surveys in Plan View, July 1988 through December 1999
Figure 13 - Relative Displacement Vectors of Spillway Training Wall Monument Lateral Location Surveys, July 1988 through December 1999
Figure 14 - Spillway Training Wall Monument Lateral Location Surveys in Plan View, July 1988 through December 1999
Figure 15 - Downstream Crest Monument Vertical Location Surveys in Section View, July 1988 through December 1999
Figure 16 - Upstream Crest Monument Vertical Location Surveys in Section View, July 1988 through December 1999
Figure 17 - Spillway Training Wall Monument Vertical Location Surveys in Section View, July 1988 through December 1999
Figure 18 – Inclinometer Plot – SI-3, Landslide "A" – Left Abutment

Cc w/encl. J. Wang, J. Sutcliffe, R. Fields, G. Faler, S. Choy, J Aguilera, M. Khan, J. Mueller, J. Nelson, File.

TABLE 1
Pertinent Dam Statistics (As-built modifications, 1988)
Leroy Anderson Dam

Page 1 of 1

DSOD No.	Year Completed	Type	Dam Height ft	Dam Crest Length ft	Storage Capacity (acre-ft)	Dam Crest Elev. ft	Spillway Crest Elev. ft	Total Freeboard ft
72-9	1950	Rolled Earth & Rock Fill	240	1,385	89,073	646.3	627.8	18.5

Note: basis of elevations is NAVD 1988 - values in this table are 2.8 feet higher than those in reports submitted prior to 1998

TABLE 2
1993 through 1999 Piezometer and Monthly Rainfall Data
Leroy Anderson Dam
Page 1 of 3

Date	Reservoir Level (ft)	PPA-1	PPA-2	Monthly* Rainfall (in)
		Piezometric Surface Elevation (ft)		
01/20/93	549.32	552.27	473.61	9.48
02/17/93	592.28	552.96	474.07	6.59
03/17/93	619.85	553.43	477.53	2.36
04/20/93	626.38	553.89	AH	0.47
05/19/93	623.35	555.04	481.00	0.67
06/16/93	621.30	555.51	482.61	0.64
07/14/93	620.36	553.89	485.62	0.00
08/18/93	617.65	558.05	486.31	0.00
09/16/93	612.35	558.97	AH	0.00
10/28/93	606.05	564.05	491.16	0.43
11/18/93	605.82	562.67	AH	1.70
12/20/93	605.52	563.13	493.70	1.50
1/18/94	604.55	567.06	492.78	1.88
02/17/94	604.98	567.98	493.93	4.35
03/23/94	606.28	568.67	494.40	0.55
04/26/94	602.65	569.37	494.63	0.91
05/17/94	598.42	569.37	494.63	1.54
06/22/94	591.82	569.83	494.86	0.00
07/20/94	589.62	567.52	492.32	0.00
08/16/94	587.02	568.67	494.40	0.00
09/19/94	583.48	567.75	491.85	0.00
10/12/94	581.32	569.13	492.55	0.39
11/16/94	574.78	567.75	491.85	2.02
12/15/94	573.85	567.75	490.93	1.50
01/17/95	585.82	565.90	490.01	11.11
02/15/95	609.08	565.44	491.85	0.59
03/15/95	624.22	564.98	492.09	9.09
04/18/95	627.08	568.44	495.32	1.44
05/17/95	627.23	568.21	497.17	0.56
06/14/95	627.09	574.91	499.02	0.48
07/17/95	625.08	576.99	498.32	0.00
08/15/95	622.11	578.84	501.56	0.00
09/19/95	617.58	579.76	501.79	0.00
10/17/95	611.78	579.53	500.63	0.12
11/15/95	607.46	AH	499.02	0.00
12/18/95	607.48	577.68	499.94	6.34
01/19/96	606.01	573.99	498.78	3.34
02/16/96	618.44	574.91	498.09	7.57
03/18/96	627.44	575.37	500.17	2.44

TABLE 2
1993 through 1999 Piezometer and Monthly Rainfall Data
Leroy Anderson Dam
Page 2 of 3

Date	Reservoir Level (ft)	PPA-1	PPA-2	Monthly* Rainfall (in)
		Piezometric Surface Elevation (ft)		
04/15/96	627.11	578.14	500.40	0.94
05/20/96	625.93	579.30	501.09	1.69
06/17/96	621.17	578.37	501.56	0.00
07/15/96	616.35	580.45	502.94	0.00
8/19/96	610.63	582.76	502.71	0.00
9/12/96	608.02	579.76	502.25	0.00
10/17/96	602.22	578.61	502.48	1.46
11/19/96	602.06	576.53	500.40	2.39
12/06/96	600.57	576.30	499.02	7.28
01/16/97	626.16	576.53	501.09	11.11
02/18/97	626.68	577.22	502.94	0.08
03/17/97	621.46	578.14	503.64	0.16
04/14/97	621.24	579.99	503.17	0.00
05/15/97	620.00	579.53	501.33	0.16
06/24/97	617.31	576.76	503.87	0.04
07/15/97	614.36	582.76	503.87	0.00
08/18/97	607.17	581.38	503.40	0.08
09/23/97	602.22	579.76	503.64	0.00
10/14/97	599.59	578.37	499.71	0.40
11/19/97	595.15	577.22	500.17	4.22
12/15/97	591.22	575.83	497.63	2.32
01/21/98	596.09	574.91	495.55	6.42
02/17/98	629.14	576.53	500.40	12.05
03/16/98	626.06	577.03	502.02	2.44
04/16/98	627.10	578.84	502.71	1.50
05/18/98	627.00	580.22	501.33	2.36
06/22/98	627.33	582.35	504.91	0.00
07/14/98	625.10	584.38	505.25	0.00
08/17/98	619.80	584.15	505.48	0.00
09/15/98	614.60	583.69	505.48	0.16
10/14/98	611.30	583.23	499.71	0.51
11/17/98	609.80	581.61	504.10	2.73
12/14/98	605.89	580.92	502.02	0.79
1/15/99	604.27	579.76	502.94	3.03
2/17/99	613.06	584.61	bad reading	2.87
3/17/99	617.86	580.68	501.79	2.24
4/15/99	623.66	582.65	501.33	1.69
5/17/99	623.14	584.61	503.40	0.00
6/16/99	622.06	585.19	502.83	0.00

TABLE 2
1993 through 1999 Piezometer and Monthly Rainfall Data
Leroy Anderson Dam
Page 3 of 3

Date	Reservoir Level (ft)	PPA-1	PPA-2	Monthly* Rainfall (in)
		Piezometric Surface Elevation (ft)		
7/14/99	619.90	582.30	503.40	0.00
8/16/99	616.55	577.91	501.33	0.00
9/24/99	610.80	582.19	505.02	0.00
10/20/99	608.04	580.68	504.10	0.04
11/29/99	604.27	580.68	503.87	1.34
12/16/99	603.94	582.76	502.94	0.24

Notes:

1) basis of elevations is NAVD 1988 - values in this table are 2.8 feet higher than those in reports submitted prior to 1998
2) * = total rainfall at end of indicated month in Date column
3) AH = anomalously high reading

TABLE 3
1993 through 1998 Spillway Underdrain Flow Data
Leroy Anderson Dam
Page 1 of 3

Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)
05/21/93	623.22	87	06/29/93	620.95	122	10/01/93	609.82	82
05/22/93	623.12	126	06/30/93	620.95	121	10/04/93	609.28	80
05/23/93	623.02	120	07/01/93	620.92	122	10/08/93	608.68	79
05/24/93	622.95	131	07/02/93	620.88	122	10/11/93	608.28	78
05/25/93	622.92	125	07/03/93	620.82	121	10/14/93	607.92	76
05/26/93	622.82	124	07/04/93	620.78	121	10/18/93	607.55	76
05/27/93	622.75	124	07/05/93	620.75	121	10/21/93	607.12	75
05/28/93	622.65	123	07/06/93	620.72	121	10/25/93	606.42	74
05/29/93	622.58	124	07/07/93	620.68	121	10/28/93	606.05	72
05/30/93	622.52	123	07/08/93	620.65	121	02/22/94	605.48	66
05/31/93	622.42	124	07/09/93	620.62	121	02/24/94	605.48	43
06/01/93	622.35	123	07/11/93	620.52	121	02/28/94	606.98	60
06/02/93	622.25	123	07/12/93	620.48	121	03/03/94	607.48	63
06/03/93	622.15	123	07/13/93	620.45	121	03/07/94	606.85	65
06/04/93	622.08	124	07/14/93	620.38	121	03/10/94	606.38	64
06/05/93	622.02	124	07/15/93	620.35	121	03/17/94	606.32	63
06/06/93	621.95	124	07/16/93	620.32	121	03/21/94	606.32	62
06/07/93	621.92	123	07/19/93	620.22	120	03/24/94	606.28	63
06/08/93	621.85	124	07/22/93	620.08	120	03/28/94	606.35	63
06/09/93	621.78	113	07/27/93	619.95	120	03/31/94	606.32	61
06/10/93	621.72	126	07/29/93	619.88	120	04/04/94	606.32	61
06/11/93	621.65	122	08/02/93	619.75	120	04/07/94	606.02	61
06/12/93	621.58	122	08/06/93	619.52	120	04/11/94	605.38	59
06/13/93	621.52	103	08/09/93	619.08	120	04/14/94	604.88	60
06/14/93	621.45	125	08/12/93	618.62	118	04/18/94	604.18	53
06/15/93	621.38	122	08/16/93	617.95	116	04/21/94	603.55	39
06/16/93	621.35	122	08/19/93	617.48	114	04/25/94	602.75	37
06/18/93	621.22	122	08/23/93	616.85	112	04/28/94	602.35	34
06/19/93	621.22	121	08/27/93	616.12	109	05/02/94	601.62	32
06/20/93	621.18	121	08/30/93	615.45	107	05/05/94	601.12	35
06/21/93	621.15	123	09/02/93	614.85	104	05/09/94	600.45	31
06/22/93	621.12	121	09/07/93	613.98	100	05/12/94	599.75	26
06/23/93	621.12	121	09/09/93	613.62	94	05/16/94	598.68	24
06/24/93	621.08	122	09/13/93	612.85	91	05/19/94	598.08	28
06/25/93	621.08	122	09/16/93	612.35	88	05/23/94	597.25	24
06/26/93	621.08	123	09/20/93	611.82	87	05/26/94	596.45	21
06/27/93	621.05	121	09/23/93	611.25	86	05/31/94	594.85	17
06/28/93	621.02	122	09/27/93	610.52	84	06/02/94	594.32	3

TABLE 3
1993 through 1998 Spillway Underdrain Flow Data
Leroy Anderson Dam
Page 2 of 3

Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)	Date	Reservoir Level (ft)	Underdrain Flow (gpm)
06/06/94	593.82	2	09/05/95	619.58	116	06/17/96	621.17	143
06/09/94	593.45	0	09/07/95	619.42	116	06/20/96	620.70	142
06/16/94	592.58	0	09/18/95	617.75	114	06/25/96	619.86	139
06/23/94	591.72	0	09/25/95	616.52	104	06/27/96	619.54	137
03/02/95	609.22	37	09/28/95	616.08	102	07/01/96	618.88	121
03/06/95	609.28	38	10/02/95	615.58	101	07/11/96	617.08	110
03/09/95	609.35	39	10/12/95	613.03	95	07/15/96	616.35	125
03/11/95	615.58	52	10/16/95	612.00	87	07/19/96	615.67	121
05/11/95	626.82	109	10/19/95	611.42	85	07/22/96	615.09	121
05/15/95	627.02	114	10/26/95	610.09	81	07/25/96	614.47	119
05/18/95	627.18	115	10/30/95	609.34	78	07/29/96	613.67	116
05/22/95	627.32	117	11/02/95	608.84	75	08/01/96	613.01	113
05/25/95	627.38	119	11/09/95	607.53	72	08/05/96	612.58	110
05/30/95	627.52	121	11/13/95	607.47	67	08/12/96	611.52	106
06/05/95	627.32	123	11/16/95	607.46	66	08/16/96	611.00	101
06/08/95	627.18	127	11/20/95	607.22	65	08/19/96	610.63	98
06/12/95	626.95	127	11/27/95	607.15	64	08/22/96	610.29	96
06/15/95	627.05	129	12/07/95	609.10	64	08/26/96	609.86	94
06/19/95	626.75	130	12/11/95	607.04	64	08/29/96	609.56	90
06/26/95	626.45	130	12/18/95	607.48	71	09/05/96	608.81	88
06/29/95	626.25	131	12/21/95	606.65	67	09/12/96	608.02	83
07/03/95	626.02	104	12/26/95	605.95	65	09/16/96	607.56	79
07/06/95	625.82	85	12/28/95	605.96	55	09/30/96	606.26	73
07/10/95	625.52	128	01/04/96	606.06	61	10/03/96	605.76	69
07/13/95	625.32	128	01/08/96	605.97	59	10/07/96	604.63	66
07/17/95	625.08	128	01/11/96	605.95	58	10/10/96	603.87	61
07/20/95	624.88	128	01/18/96	605.97	59	10/17/96	602.22	56
07/24/95	624.55	128	01/25/96	606.42	61	10/22/96	601.22	49
07/27/95	624.38	128	02/05/96	614.52	72	10/24/96	601.30	46
07/31/95	624.08	128	05/13/96	626.62	157	10/28/96	601.55	46
08/03/95	623.82	127	5/16/96	626.39	158	11/01/96	601.81	48
08/07/95	623.25	126	5/21/96	625.86	158	11/07/96	602.10	45
08/10/95	622.82	125	5/23/96	625.63	155	11/14/96	602.29	46
08/14/95	622.28	124	5/28/96	624.94	155	11/18/96	602.16	48
08/17/95	621.85	122	06/04/96	623.16	151	11/25/96	601.65	48
08/24/95	620.95	121	06/06/96	622.73	146	12/05/96	600.64	43
08/28/95	620.42	119	06/10/96	622.14	146	12/09/96	600.50	41
08/31/95	620.08	119	06/13/96	621.70	145	12/12/96	601.29	46

TABLE 3
1993 through 1998 Spillway Underdrain Flow Data
Leroy Anderson Dam
Page 3 of 3

Date	Reservoir Level (ft)	Underdrain flow (gpm)
12/16/96	601.00	42
12/19/96	600.77	40
12/23/96	602.58	46
12/30/96	603.23	48
1/2/97	611.60	58
6/11/97	618.32	133
6/18/97	617.80	132
6/26/97	617.13	130
7/2/97	616.20	126
7/9/97	615.25	122
7/16/97	614.21	118
8/6/97	610.07	107
8/14/97	608.08	91
8/20/97	606.77	81
8/27/97	605.56	73
9/3/97	604.31	64
9/10/97	603.49	57
9/17/97	603.02	53
9/24/97	602.16	50
10/1/97	601.59	41
10/8/97	601.02	44
10/15/97	599.41	40
10/22/97	598.31	34
10/29/97	598.37	29
11/5/97	597.43	28
11/13/97	596.09	25
11/19/97	595.15	22
12/4/97	592.56	14
12/10/97	591.70	9
12/17/97	590.96	1
3/12/98	626.36	130
3/18/98	625.86	133
3/25/98	627.28	136
4/1/98	627.23	144
4/8/98	626.97	146
4/15/98	627.09	149
4/22/98	627.16	152
4/29/98	627.42	155
5/6/98	627.28	159
5/13/98	627.12	161
5/21/98	626.96	161
5/28/98	627.29	161
6/3/98	627.01	162
6/10/98	626.96	160
6/24/98	626.88	162
7/8/98	625.85	166
7/15/98	624.96	163
7/29/98	623.35	156
8/5/98	622.29	150
8/12/98	620.90	145
8/19/98	619.50	136
8/26/98	618.20	131
9/2/98	616.88	124
9/10/98	615.43	117
9/30/98	612.62	106
10/7/98	611.93	99
10/14/98	611.26	95
10/22/98	610.52	91
10/29/98	609.84	88
11/5/98	610.12	84
11/12/98	610.46	87
11/18/98	609.62	84
12/25/98	608.37	79
12/4/98	607.27	75
12/9/98	606.70	69
12/16/98	605.81	63
1/19 through 12/99		**

Notes: 1) NR = Underdrain flow not recorde ft = feet
2) gpm = gallons per minute
3) basis of reservoir elevations is NAVD 1988 - values in this table are 2.8 feet higher than those in reports submitted prior to 1998
4) ** no data collected from January 1999 through December 1999 (see text)

TABLE 4
Former Monument Survey X and Y Direction Data
1993 through 1998 Monument Survey Data
Leroy Anderson Dam
Page 1 of 1

Date	Monument X Direction Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	-0.10	-0.03	-0.03	-0.09	-0.12	-0.04	-0.12	-0.03	-0.09	-0.02	-0.07	-0.12	-0.01	-0.06	-0.02	-0.06	-0.05	-0.06	-0.06
1/11/94	-0.07	-0.06	-0.04	-0.09	-0.13	-0.07	-0.18	-0.09	-0.17	-0.08	-0.12	-0.17	-0.04	-0.09	-0.03	-0.06	-0.04	-0.06	-0.05
12/05/94	-0.05	-0.03	-0.03	-0.09	-0.13	-0.06	-0.17	-0.08	-0.16	-0.07	-0.12	-0.18	-0.04	-0.09	-0.03	-0.07	-0.05	-0.06	-0.06
1/4/96	-0.03	0.01	0.00	-0.09	-0.14	-0.09	-0.22	-0.13	-0.21	-0.12	-0.15	-0.23	-0.06	-0.12	-0.03	-0.08	-0.06	-0.08	-0.07
5/22/96*	NR	NR	NR	-0.10	-0.13	-0.10	-0.24	-0.15	-0.23	-0.12	-0.19	-0.25	-0.09	-0.15	-0.05	-0.10	-0.08	-0.09	-0.07
1/29/97	NR	-0.02	-0.03	-0.10	-0.15	-0.11	-0.24	-0.16	-0.25	-0.14	-0.20	-0.24	-0.09	-0.14	-0.05	-0.09	-0.07	-0.07	-0.08
12/11/98	-0.02	-0.03	-0.02	-0.09	-0.18	-0.17	-0.27	-0.19	-0.27	-0.15	-0.19	-0.23	-0.07	-0.11	-0.02	-0.08	-0.05	-0.08	-0.07
12/3/99	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

Date	Monument Y Direction Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	-0.07	-0.07	-0.06	-0.06	-0.07	-0.10	-0.06	-0.10	-0.05	-0.05	-0.01	0.00	-0.02	-0.01	-0.03	-0.03	-0.05	-0.04	-0.06
1/11/94	-0.08	-0.05	-0.04	-0.06	-0.07	-0.10	-0.06	-0.09	-0.02	-0.04	0.00	0.01	0.01	-0.01	-0.01	-0.04	-0.03	-0.03	-0.05
12/05/94	-0.09	-0.07	-0.07	-0.06	-0.07	-0.10	-0.06	-0.10	-0.05	-0.06	0.00	0.01	-0.01	-0.01	-0.01	-0.04	-0.04	-0.04	-0.05
1/4/96	-0.07	-0.09	-0.04	-0.06	-0.08	-0.11	-0.06	-0.11	-0.04	-0.06	0.00	0.02	0.00	-0.01	-0.02	-0.04	-0.06	-0.05	-0.06
5/22/96*	NR	NR	NR	-0.05	-0.04	-0.06	-0.02	-0.05	0.01	-0.01	0.02	0.02	-0.01	-0.03	-0.04	-0.06	-0.06	-0.06	-0.07
1/29/97	NR	-0.05	-0.04	-0.04	-0.05	-0.07	-0.03	-0.06	0.00	-0.02	0.03	0.03	0.01	0.00	-0.02	-0.03	-0.03	-0.04	-0.05
12/11/98	-0.07	-0.05	-0.08	-0.06	-0.06	-0.07	-0.05	-0.06	-0.01	-0.03	-0.01	0.01	-0.03	-0.04	-0.06	-0.08	-0.08	-0.08	-0.10
12/3/99	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**

Notes:

1) Y direction displacement represents longitudinal movement
2) Negative X direction displacement represents downstream movement
3) Positive X direction displacement represents upstream movement
4) NR = monument survey data not recorded
5) Displacement is net movement since 1988
6) * = special monument survey after May 21, 1996 earthquake
7) ** = X and Y survey lines no longer monitored - new system uses Northings and Eastings survey data (see Table 5)

TABLE 5

Monument Survey Vertical, Northings, Eastings and Resultant Vector Displacement Data

1993 through 1999 Monument Survey Data

Leroy Anderson Dam

Page 1 of 2

Date	Monument Vertical Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	0.01	-0.03	-0.03	-0.01	-0.09	-0.11	-0.27	-0.21	-0.32	-0.26	-0.23	-0.35	-0.18	-0.16	-0.09	-0.05	-0.04	-0.04	-0.06
1/11/94	-0.02	-0.01	-0.01	0.01	-0.08	-0.07	-0.24	-0.18	-0.29	-0.25	-0.22	-0.35	-0.20	-0.16	-0.11	-0.06	-0.04	-0.03	-0.05
12/05/94	NR	NR	NR	0.02	-0.06	-0.06	-0.23	-0.17	-0.29	-0.24	-0.18	-0.30	-0.14	-0.13	-0.06	-0.02	0.00	0.02	NR
1/4/96	NR	NR	NR	-0.05	-0.12	-0.11	-0.25	-0.18	-0.30	-0.25	-0.19	-0.31	-0.14	-0.13	-0.07	-0.04	-0.03	-0.02	-0.01
5/22/96*	NR	NR	NR	0.01	-0.06	-0.04	-0.20	-0.15	-0.27	-0.24	-0.18	-0.30	-0.13	-0.12	-0.05	-0.01	-0.01	0.01	-0.01
1/29/97	NR	-0.08	-0.03	0.02	-0.05	-0.06	-0.26	-0.19	-0.34	-0.30	-0.22	-0.37	-0.18	-0.17	-0.10	-0.08	-0.03	-0.01	-0.02
12/11/98	0.00	-0.02	-0.01	0.01	-0.08	-0.07	-0.25	-0.19	-0.33	-0.28	-0.22	-0.34	-0.17	-0.15	-0.08	-0.04	-0.02	0.00	-0.01
12/3/99	0.00	-0.01	0.00	0.01	-0.07	-0.07	-0.25	-0.19	-0.32	-0.28	-0.21	-0.35	-0.17	-0.14	-0.08	-0.03	-0.01	0.01	-0.01

Date	Monument Northings Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	-0.10	-0.04	-0.04	-0.08	-0.11	-0.07	-0.11	-0.07	-0.07	-0.02	-0.03	-0.06	0.01	-0.03	0.00	-0.04	-0.05	-0.05	-0.06
1/11/94	-0.08	-0.06	-0.04	-0.08	-0.11	-0.10	-0.15	-0.10	-0.12	-0.06	-0.07	-0.10	-0.01	-0.07	-0.02	-0.07	-0.05	-0.06	-0.07
12/05/94	-0.08	-0.05	-0.05	-0.08	-0.11	-0.09	-0.15	-0.11	-0.13	-0.06	-0.07	-0.10	-0.02	-0.07	-0.02	-0.07	-0.05	-0.07	-0.08
1/4/96	-0.05	-0.03	-0.02	-0.08	-0.14	-0.12	-0.19	-0.14	-0.16	-0.10	-0.10	-0.13	-0.02	-0.09	-0.03	-0.09	-0.07	-0.09	-0.10
5/22/96*	NR	NR	NR	-0.08	-0.09	-0.09	-0.17	-0.13	-0.15	-0.08	-0.11	-0.16	-0.06	-0.12	-0.06	-0.10	-0.09	-0.10	-0.10
1/29/97	NR	-0.05	-0.05	-0.10	-0.14	-0.13	-0.20	-0.16	-0.19	-0.11	-0.11	-0.15	-0.04	-0.09	-0.04	-0.07	-0.06	-0.07	-0.08
12/11/98	-0.05	-0.05	-0.06	-0.10	-0.16	-0.16	-0.22	-0.18	-0.20	-0.12	-0.13	-0.16	-0.05	-0.10	-0.04	-0.09	-0.07	-0.09	-0.10
12/3/99	-0.07	-0.04	-0.04	-0.10	-0.15	-0.13	-0.21	-0.16	-0.20	-0.11	-0.13	-0.16	-0.05	-0.10	-0.05	-0.10	-0.08	-0.09	-0.10

TABLE 5
Monument Survey Vertical, Northings, Eastings and Resultant Vector Displacement Data
1993 through 1999 Monument Survey Data
Leroy Anderson Dam
Page 2 of 2

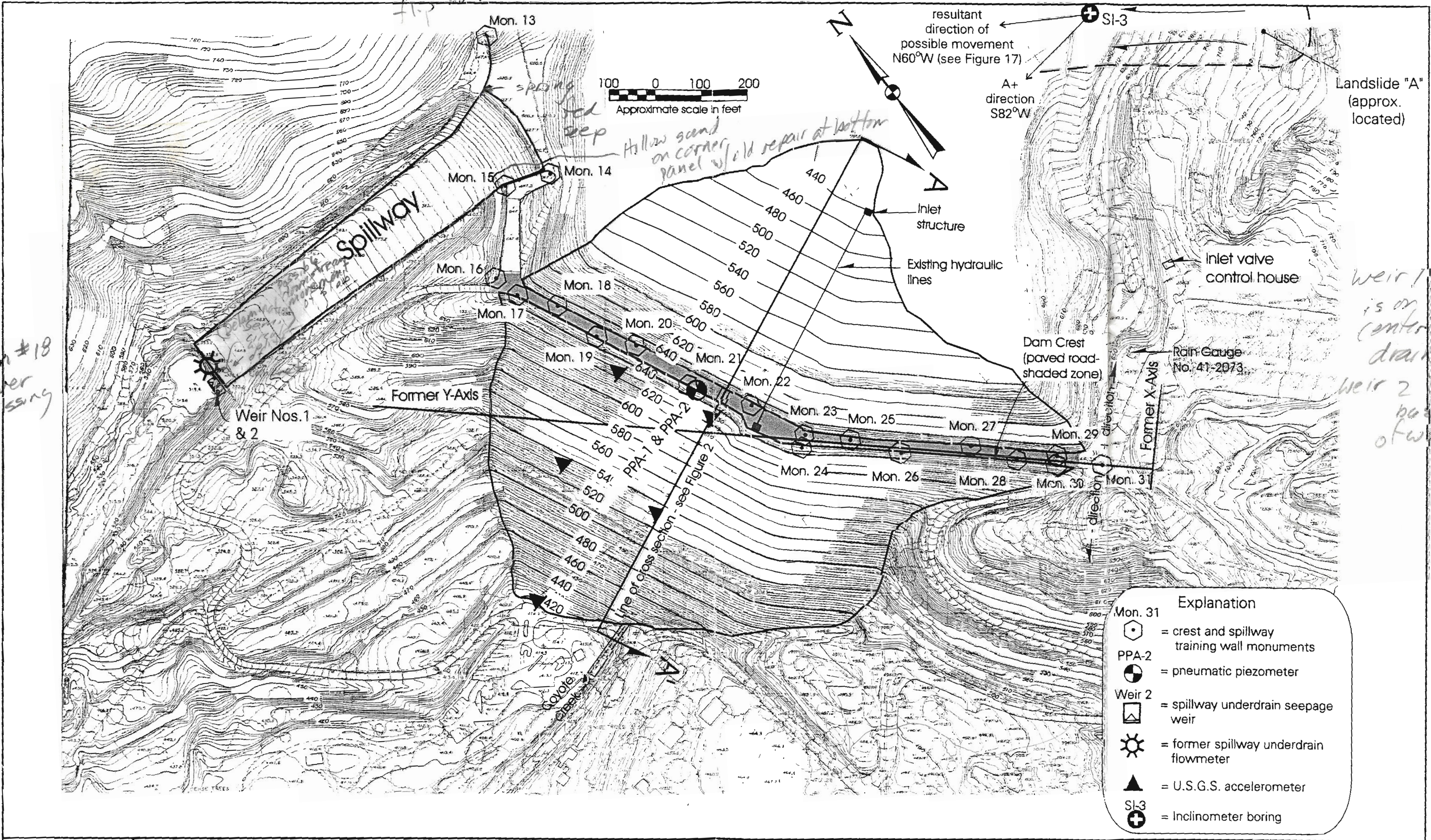
Date	Monument Eastings Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	-0.01	0.05	0.02	0.00	-0.02	0.06	-0.01	0.06	-0.02	0.03	-0.04	-0.08	0.01	-0.02	0.02	-0.01	0.00	0.00	0.02
1/11/94	0.03	0.02	0.00	0.00	-0.02	0.04	-0.06	0.02	-0.09	-0.02	-0.08	-0.12	-0.03	-0.04	-0.01	-0.01	0.00	-0.01	0.01
12/05/94	0.05	0.05	0.03	0.00	-0.02	0.04	-0.05	0.03	-0.07	0.00	-0.08	-0.12	-0.01	-0.05	-0.01	-0.02	0.00	0.00	0.00
1/4/96	0.06	0.09	0.04	0.00	-0.02	0.04	-0.07	0.00	-0.11	-0.03	-0.11	-0.15	-0.03	-0.07	0.00	-0.02	0.00	0.00	0.01
5/22/96*	NR	NR	NR	0.00	-0.03	0.01	-0.11	-0.04	-0.14	-0.06	-0.13	-0.17	-0.04	-0.06	0.00	-0.02	-0.01	-0.01	0.01
1/29/97	NR	0.00	-0.04	-0.07	-0.10	-0.05	-0.15	-0.09	-0.20	-0.10	-0.18	-0.21	-0.09	-0.11	-0.04	-0.05	-0.04	-0.04	-0.02
12/11/98	-0.02	-0.03	-0.02	-0.07	-0.11	-0.09	-0.17	-0.11	-0.21	-0.11	-0.19	-0.24	-0.10	-0.12	-0.04	-0.06	-0.05	-0.06	-0.04
12/3/99	-0.03	0.00	-0.03	-0.07	-0.10	-0.05	-0.16	-0.09	-0.21	-0.11	-0.20	-0.23	-0.11	-0.13	-0.04	-0.07	-0.05	-0.06	-0.04

Date	Monument Resultant Vector Displacement (feet)																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1/27/93	0.10	0.06	0.04	0.08	0.11	0.09	0.11	0.09	0.07	0.04	0.05	0.10	0.01	0.04	0.02	0.04	0.05	0.05	0.06
1/11/94	0.08	0.06	0.04	0.08	0.11	0.11	0.16	0.10	0.15	0.06	0.11	0.16	0.04	0.08	0.02	0.07	0.05	0.06	0.07
12/05/94	0.09	0.07	0.06	0.08	0.11	0.10	0.16	0.11	0.15	0.06	0.11	0.16	0.02	0.09	0.02	0.07	0.05	0.07	0.08
1/4/96	0.08	0.09	0.04	0.08	0.14	0.13	0.20	0.14	0.19	0.10	0.15	0.20	0.04	0.11	0.03	0.09	0.07	0.09	0.10
5/22/96*	NR	NR	NR	0.08	0.09	0.09	0.20	0.14	0.20	0.10	0.17	0.23	0.07	0.13	0.06	0.10	0.09	0.10	0.10
1/29/97	NR	0.05	0.06	0.12	0.17	0.14	0.25	0.18	0.28	0.15	0.21	0.26	0.10	0.14	0.06	0.09	0.07	0.08	0.08
12/11/98	0.05	0.06	0.06	0.12	0.19	0.18	0.28	0.21	0.29	0.16	0.23	0.29	0.11	0.16	0.06	0.11	0.09	0.11	0.11
12/3/99	0.08	0.04	0.05	0.12	0.18	0.14	0.26	0.18	0.29	0.16	0.24	0.29	0.12	0.16	0.06	0.12	0.09	0.11	0.11

Notes:

1) Negative vertical displacement represents settlement
2) Positive vertical displacement represents heave
3) Negative Northing displacement represents southern movement
4) Postive Northing displacement represents northern movement
5) Negative Easting displacement represents western movement
6) Positive Easting displacement represents eastern movement
7) NR = monument survey data not recorded
8) Displacement is net movement since 1988
9) * = special monument survey after May 21, 1996 earthquake
10) Resultant vectors calculated by vector addition of Northings & Eastings

5/4/00 DSOD site visit



Mon #18 cover missing

Weir 1 is on center drain

Weir 2 from base of wall

Notes: 1) basis of elevation is NAVD 1988 -
elevations on this map are 2.8 feet higher
than those dated earlier than 1998
2) Grid is based on California Coordinate system NAD 83
3) date of photography for map is 12/97

updated 12/27/99

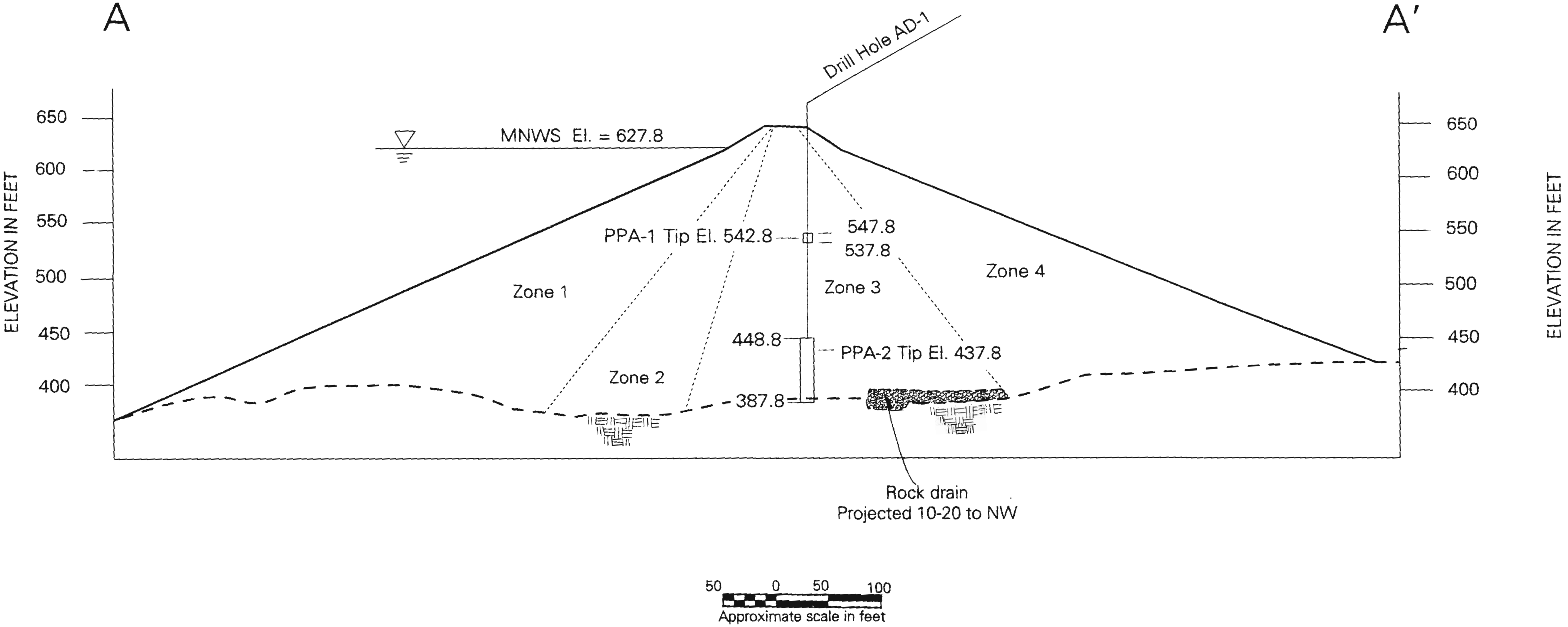
DATE	12/01/98
DESIGN	JLN
DRAWN	JLN
CHECKED	RET

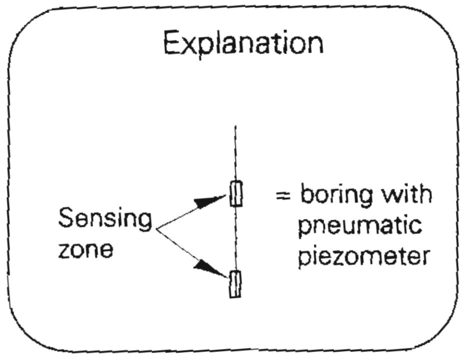
Santa Clara Valley Water District

Topographic Map
Leroy Anderson Dam (No. 72-9)
Surveillance Instrumentation

SCALE
1" = 200'

FIGURE
1





2622

308 6979

Note: 1) basis of elevation is NAVD 1988 -
elevations on this section are 2.8 feet higher
than those dated earlier than 1998

DATE	12/02/98
DESIGN	JLN
DRAWN	JLN
CHECKED	RET

Santa Clara Valley Water District

Cross Section
Leroy Anderson Dam (No. 72-9)
Piezometer Locations

SCALE
1" = 100'

FIGURE
2

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District

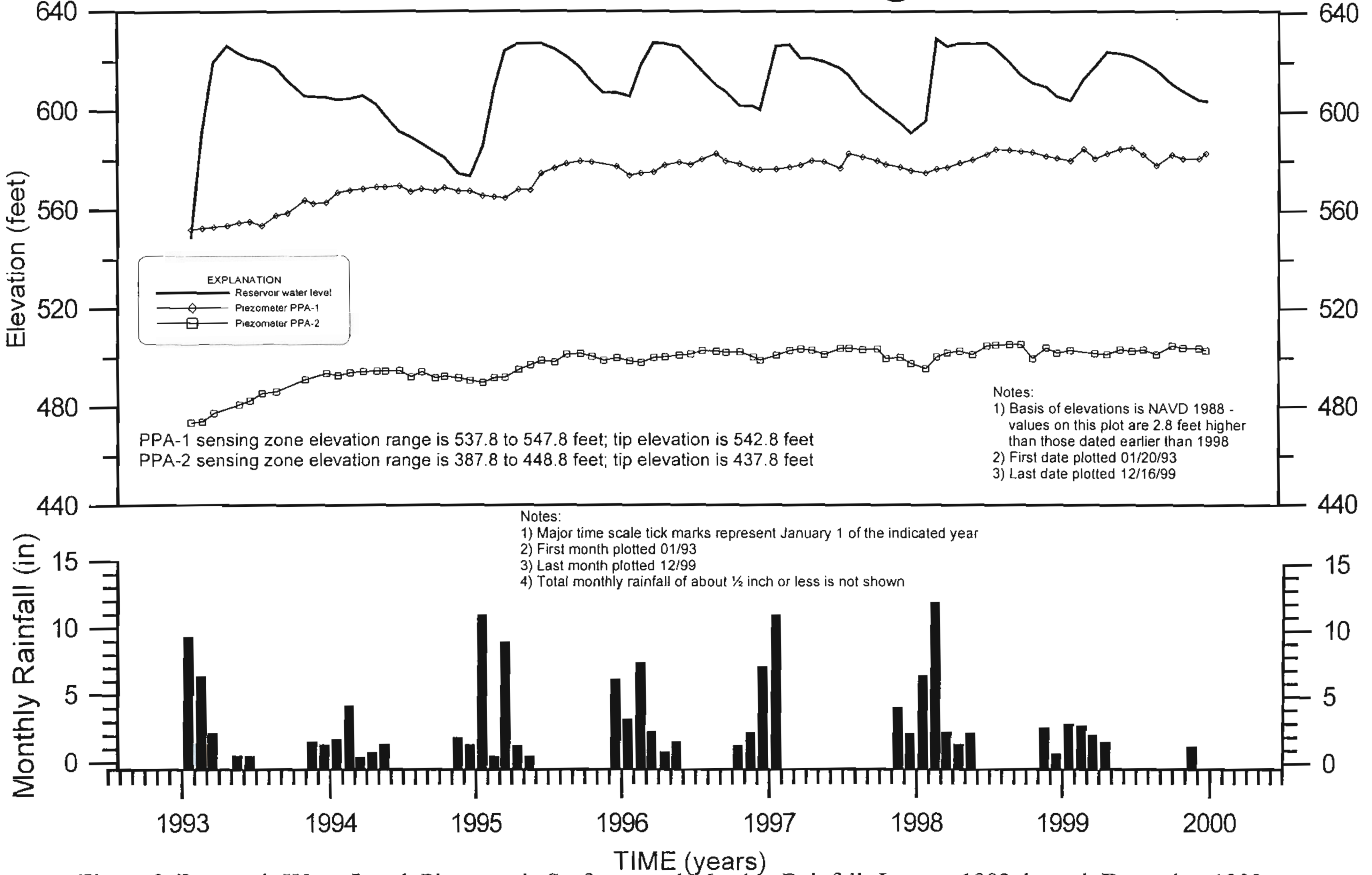


Figure 3. Reservoir Water Level, Piezometric Surfaces, and Monthly Rainfall, January 1993 through December 1999

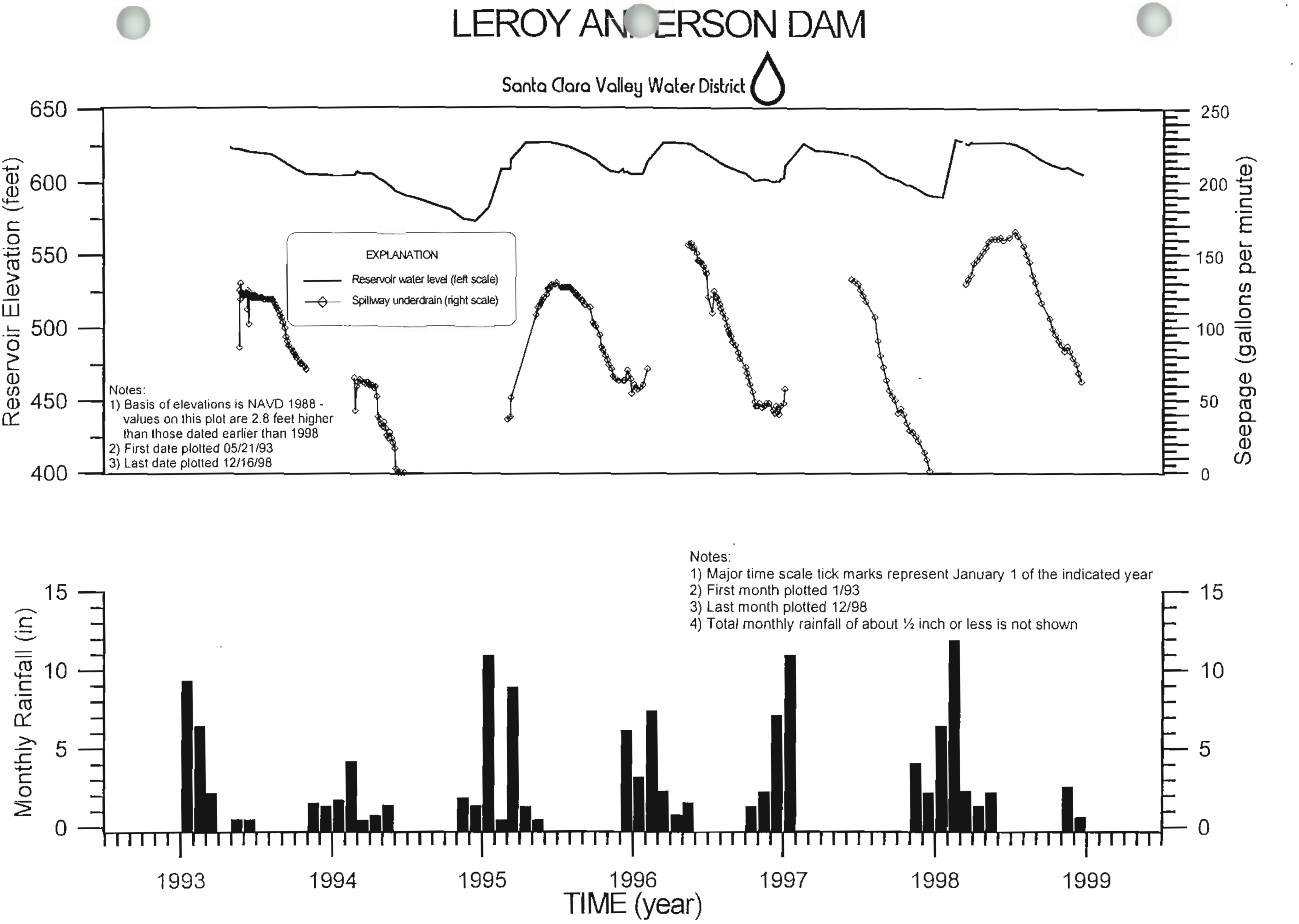
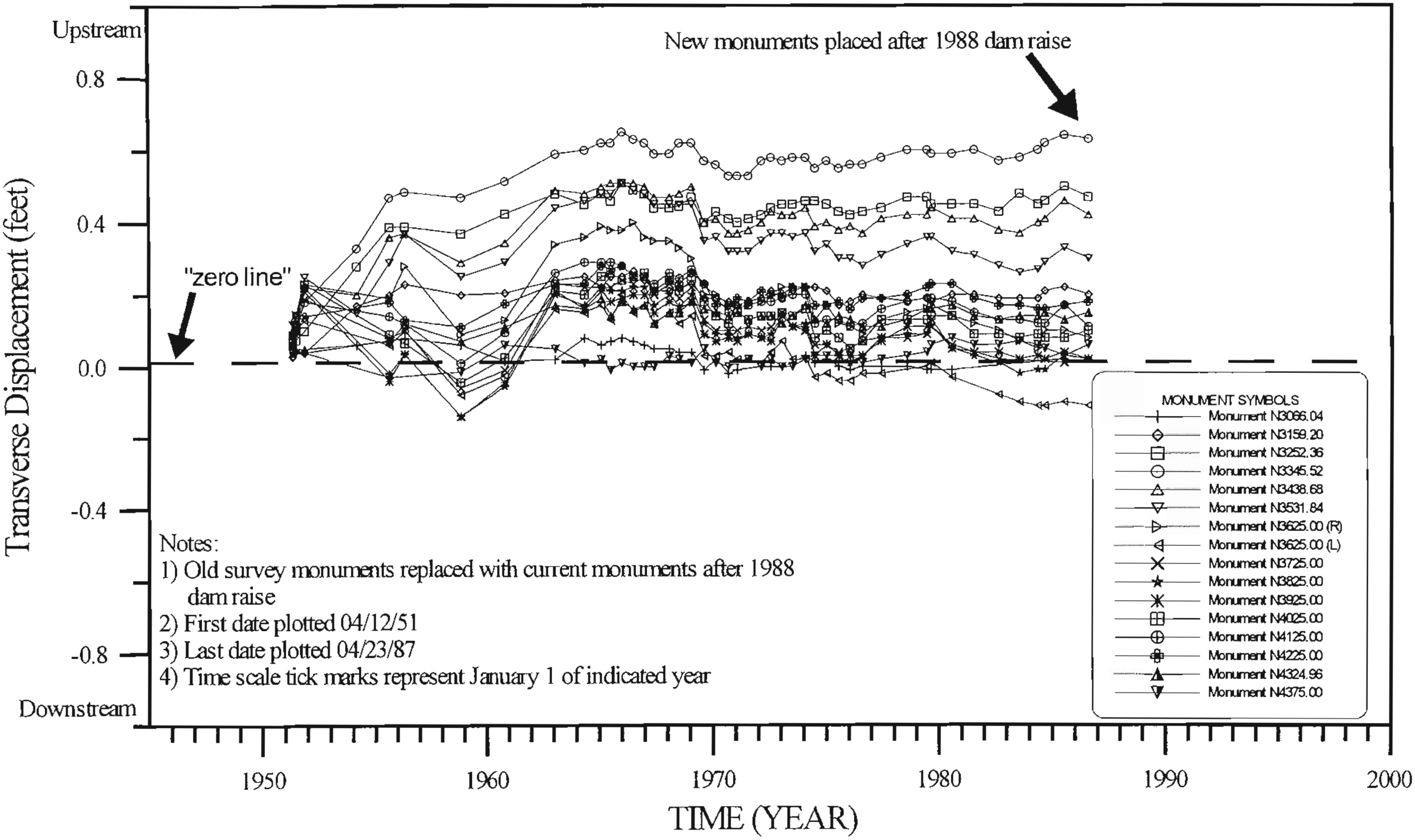


Figure 4. Reservoir Water Level, Spillway Underdrain Flow, and Monthly Rainfall, May 1993 through December 1998

LEROY ANDERSON DAM (NO. 72-9)

Santa Clara Valley Water District



Notes:
1) Old survey monuments replaced with current monuments after 1988 dam raise
2) First date plotted 04/12/51
3) Last date plotted 04/23/87
4) Time scale tick marks represent January 1 of indicated year

Figure 5. Original Crest Monument Transverse Displacement Versus Time, April 1951 through April 1987

LEROY ANDERSON DAM (N0. 72-9)

Santa Clara Valley Water District

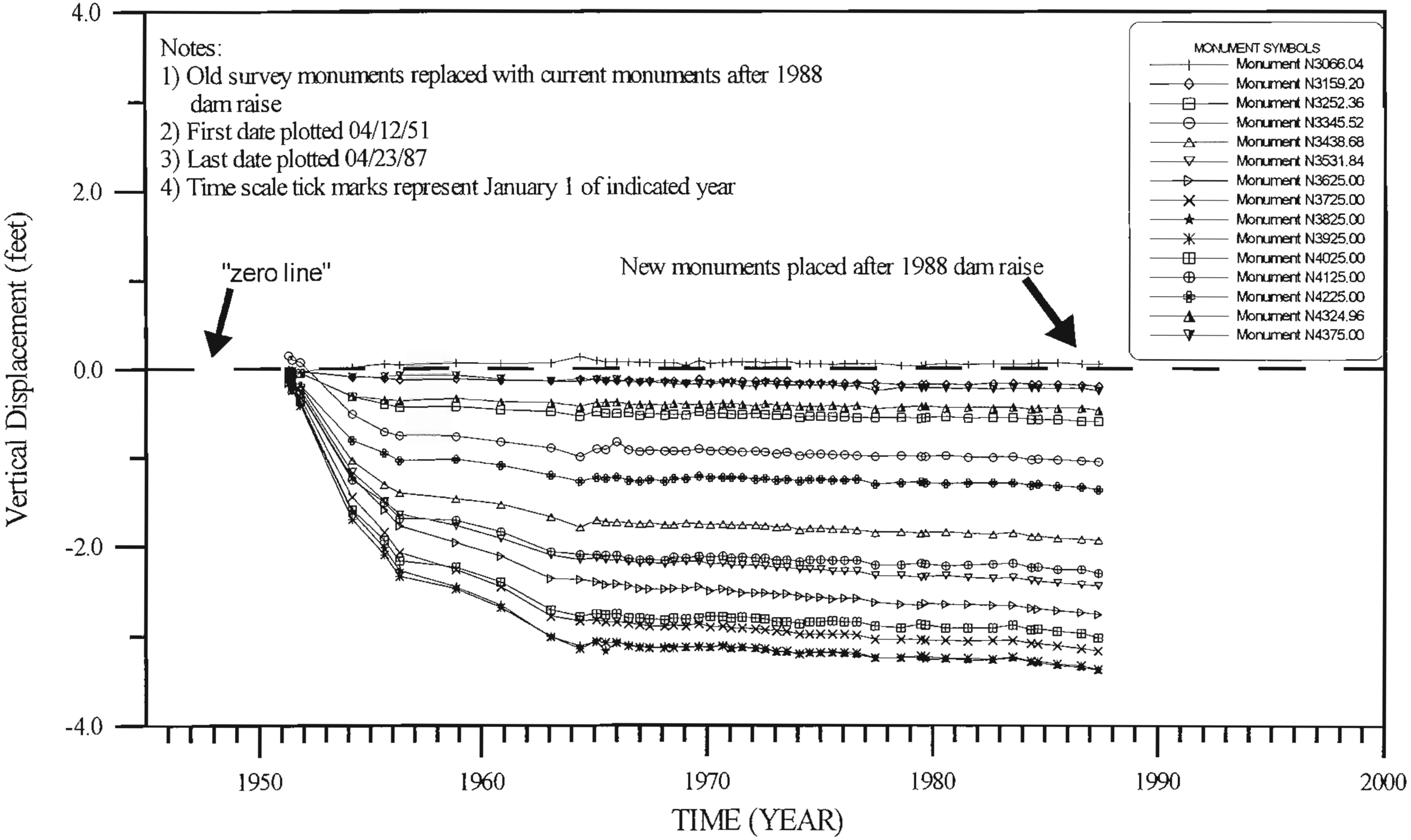
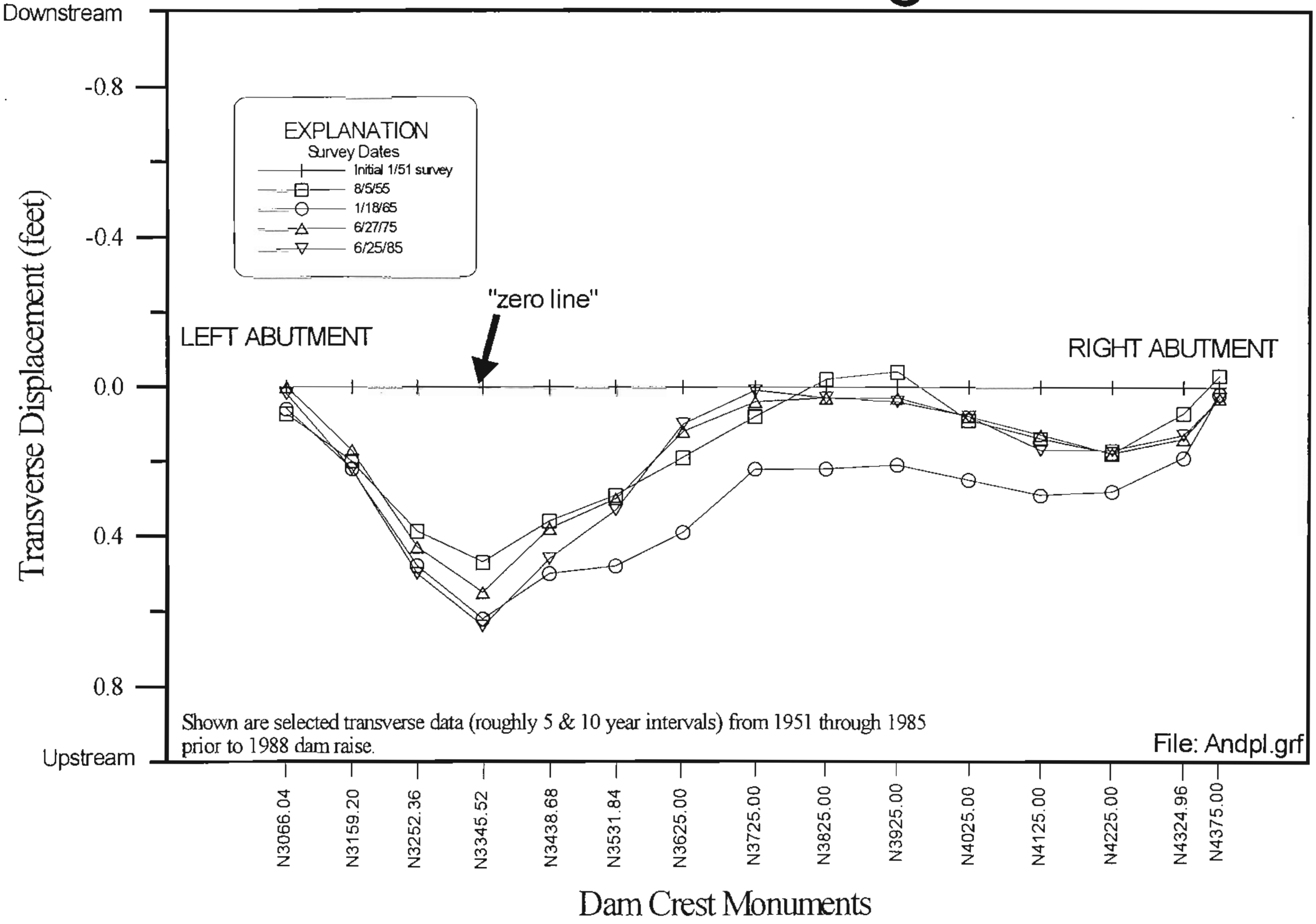


Figure 6. Original Crest Monument Vertical Displacement Versus Time, April 1951 through April 1987

LEROY ANDERSON DAM (NO. 72-9)

Santa Clara Valley Water District



Shown are selected transverse data (roughly 5 & 10 year intervals) from 1951 through 1985 prior to 1988 dam raise.

File: Andpl.grf

Figure 7. Selected Original Crest Monument Transverse Location Surveys in Plan View, January 1951 through June 1985

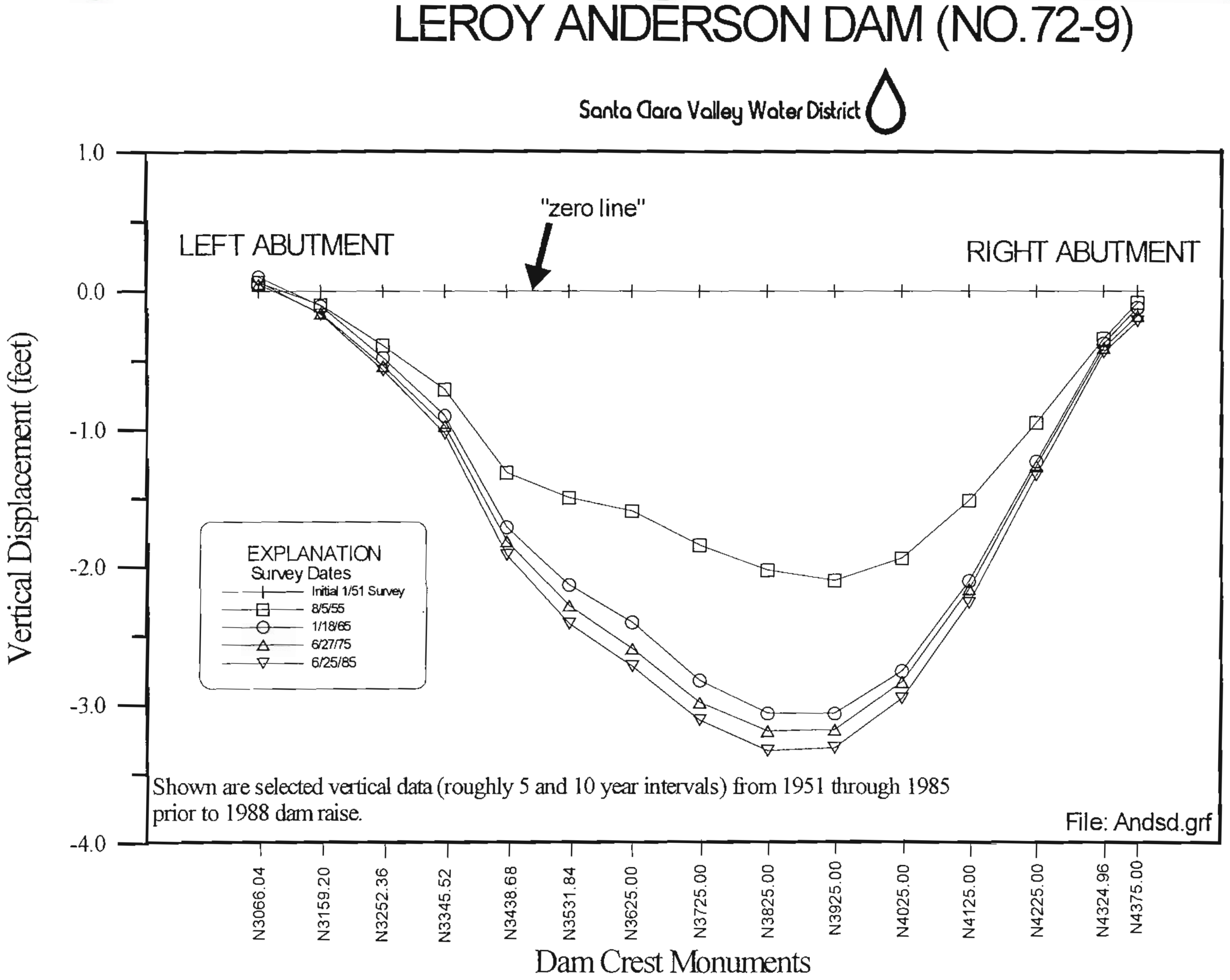
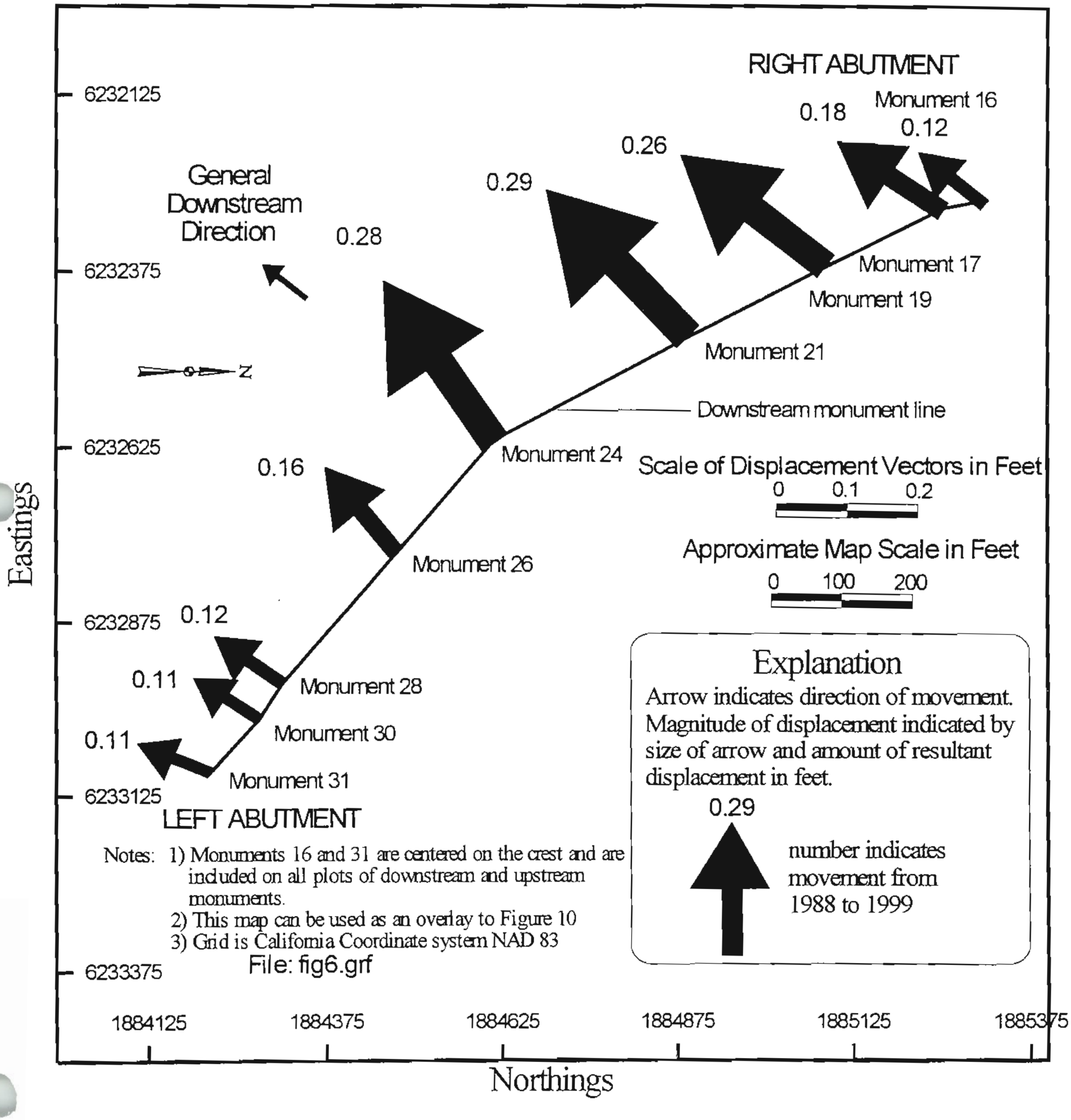


Figure 8. Selected Original Crest Monument Vertical Location Surveys in Section View, January 1951 through June 1985

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District



Arrow indicates direction of movement. Magnitude of displacement indicated by size of arrow and amount of resultant displacement in feet.

number indicates movement from 1988 to 1999

Notes: 1) Monuments 16 and 31 are centered on the crest and are included on all plots of downstream and upstream monuments.
2) This map can be used as an overlay to Figure 10
3) Grid is California Coordinate system NAD 83

File: fig6.grf

Figure 9. Relative Displacement Vectors of Downstream Crest Monument Lateral Location Surveys, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District

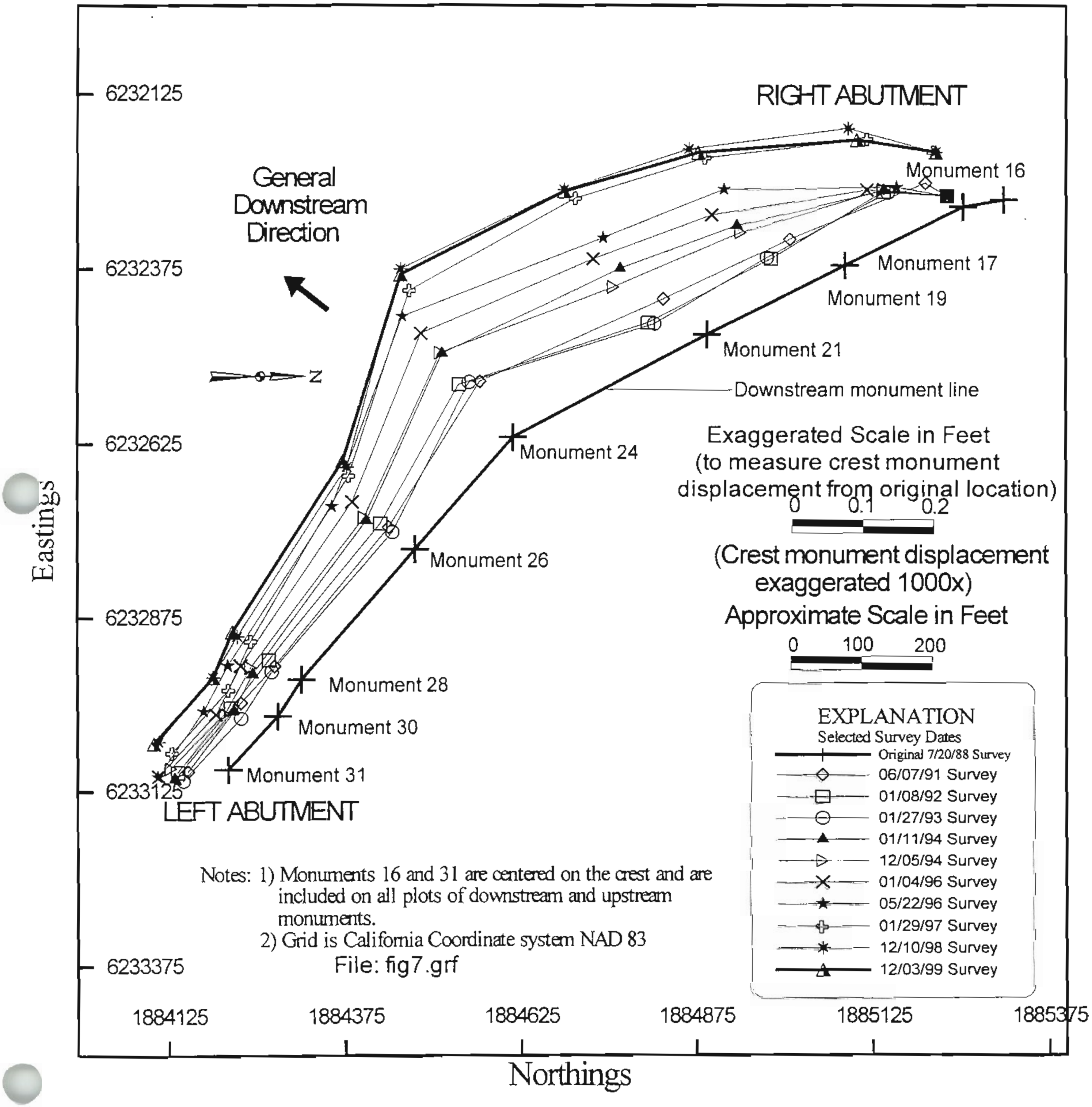
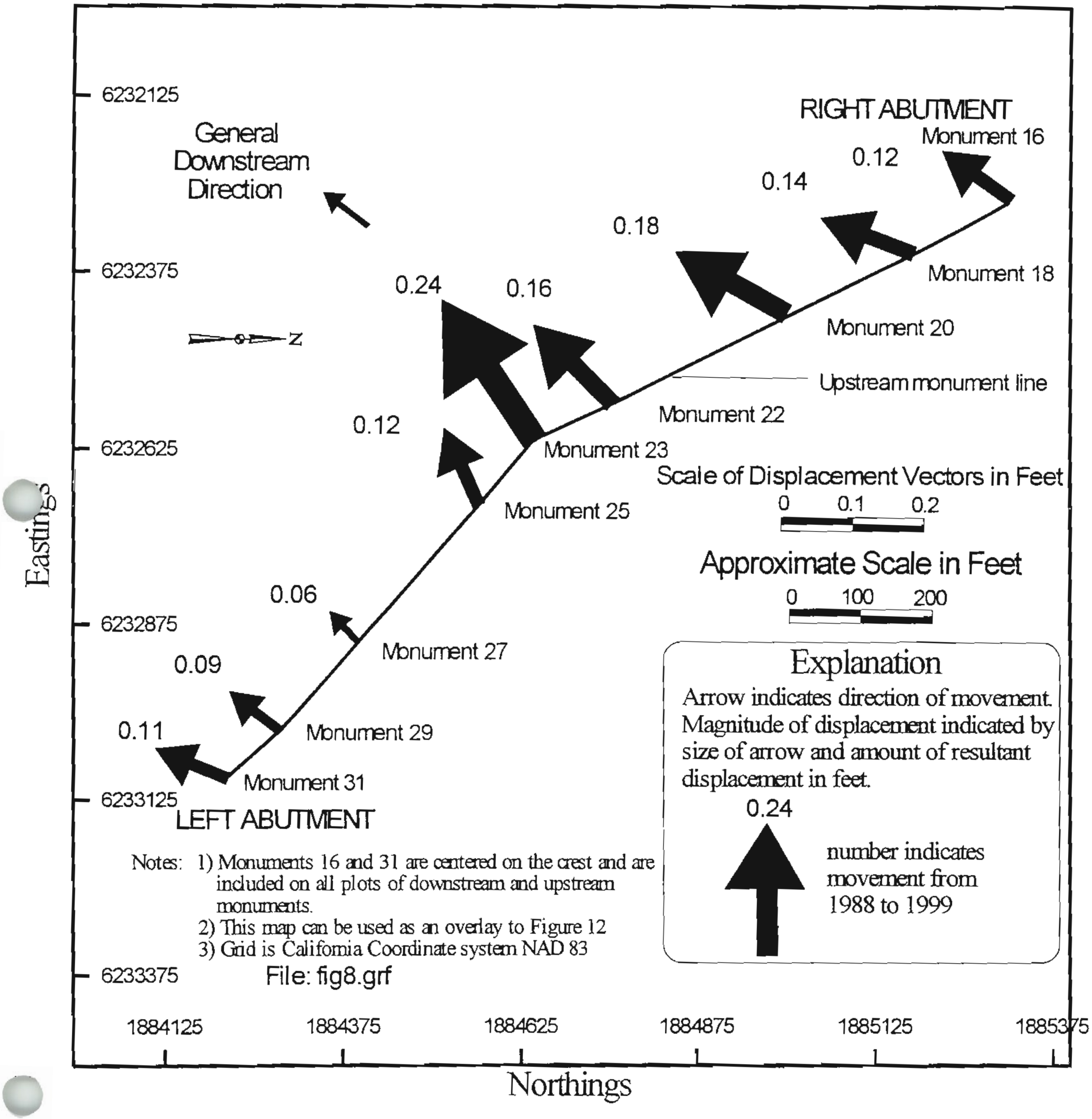


Figure 10. Downstream Crest Monument Lateral Location Surveys in Plan View, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District



Notes: 1) Monuments 16 and 31 are centered on the crest and are included on all plots of downstream and upstream monuments.
2) This map can be used as an overlay to Figure 12
3) Grid is California Coordinate system NAD 83

Explanation

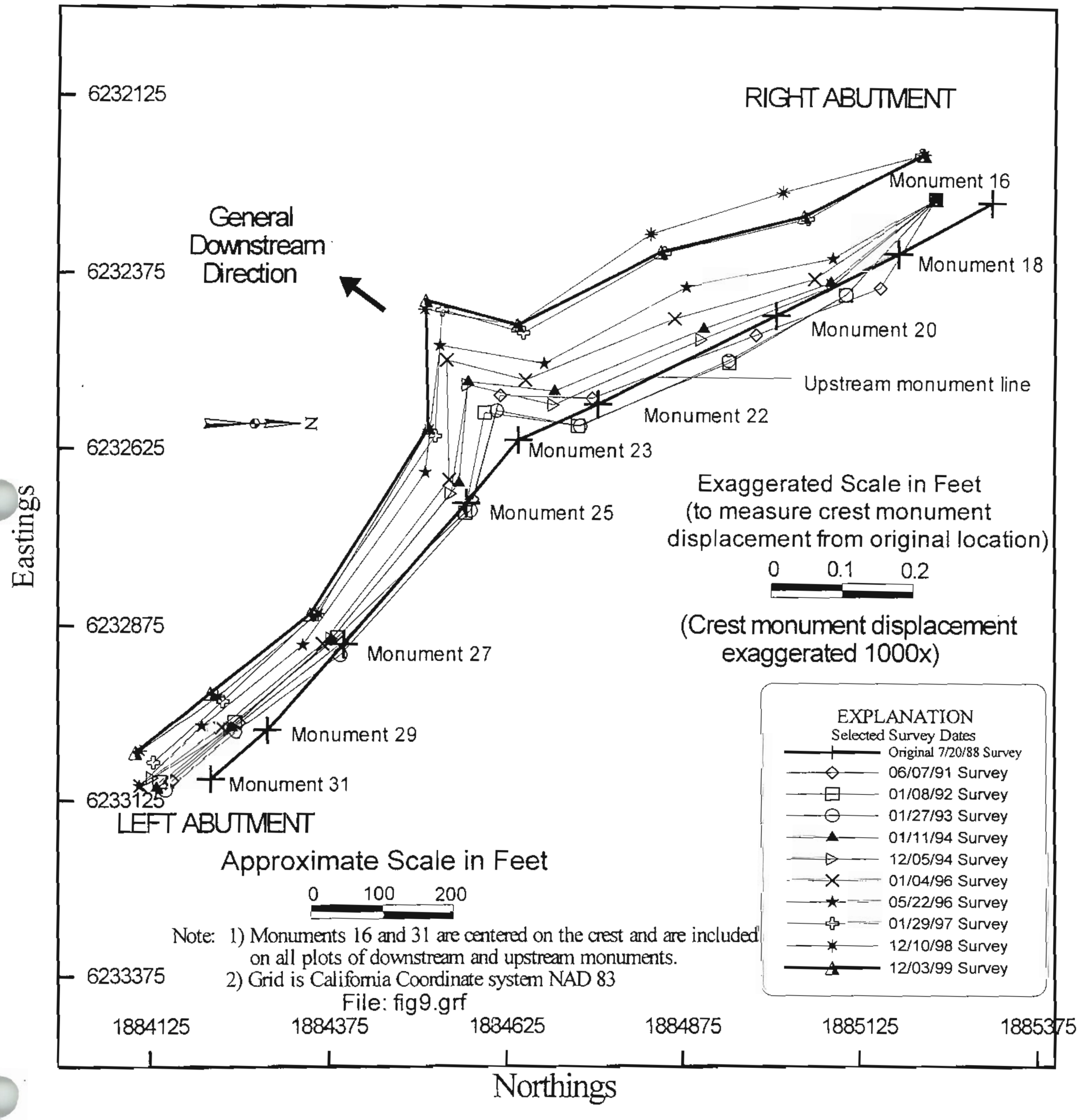
Arrow indicates direction of movement. Magnitude of displacement indicated by size of arrow and amount of resultant displacement in feet.

number indicates movement from 1988 to 1999

Figure 11 Relative Displacement Vectors of Upstream Crest Monument Lateral Location Surveys, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District



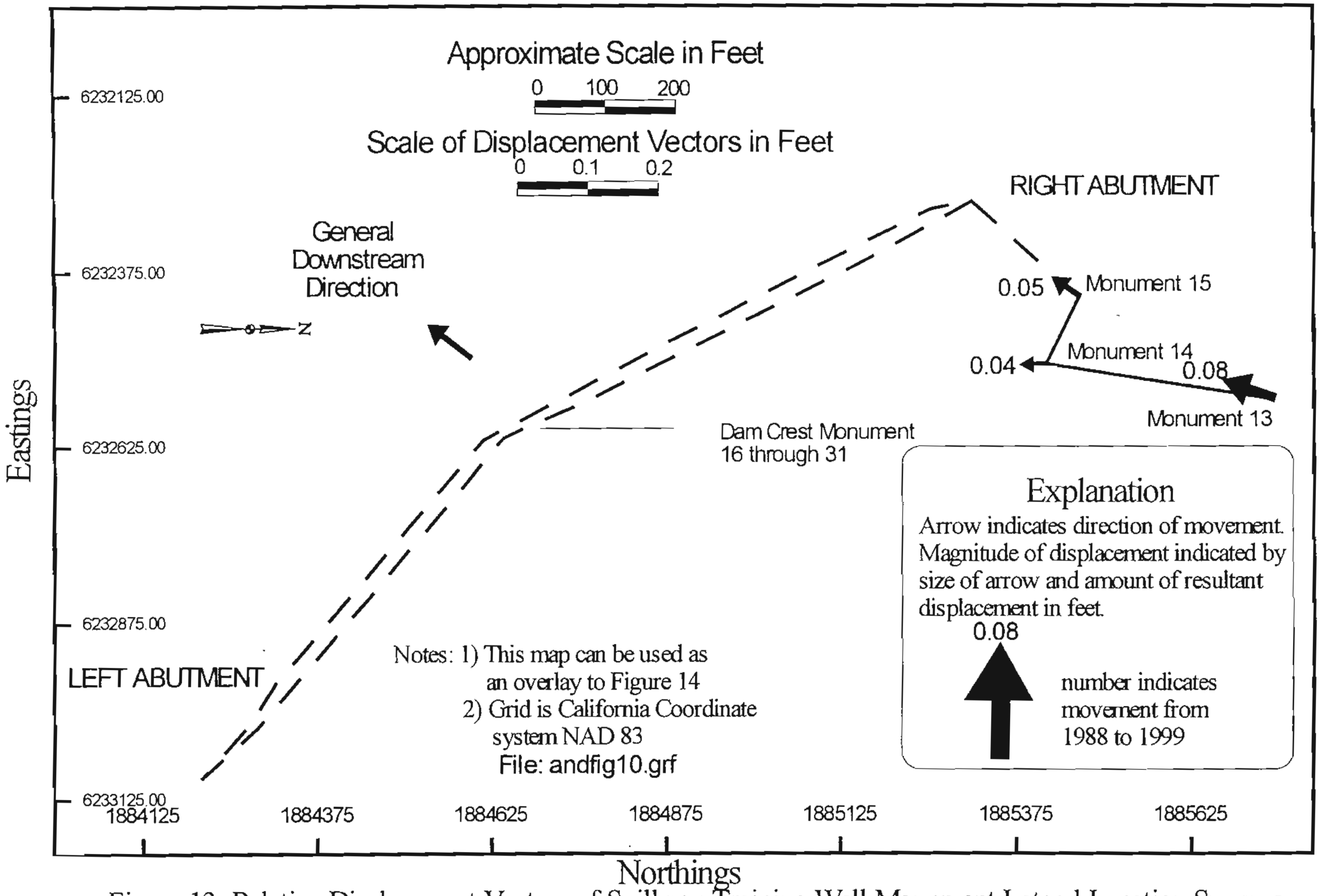
Note: 1) Monuments 16 and 31 are centered on the crest and are included on all plots of downstream and upstream monuments.
2) Grid is California Coordinate system NAD 83

File: fig9.grf

Figure 12. Upstream Crest Monument Lateral Location Surveys in Plan View, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District



Notes: 1) This map can be used as an overlay to Figure 14
2) Grid is California Coordinate system NAD 83
File: andfig10.grf

Explanation

Arrow indicates direction of movement. Magnitude of displacement indicated by size of arrow and amount of resultant displacement in feet.

0.08

number indicates movement from 1988 to 1999

Figure 13. Relative Displacement Vectors of Spillway Training Wall Monument Lateral Location Surveys, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District

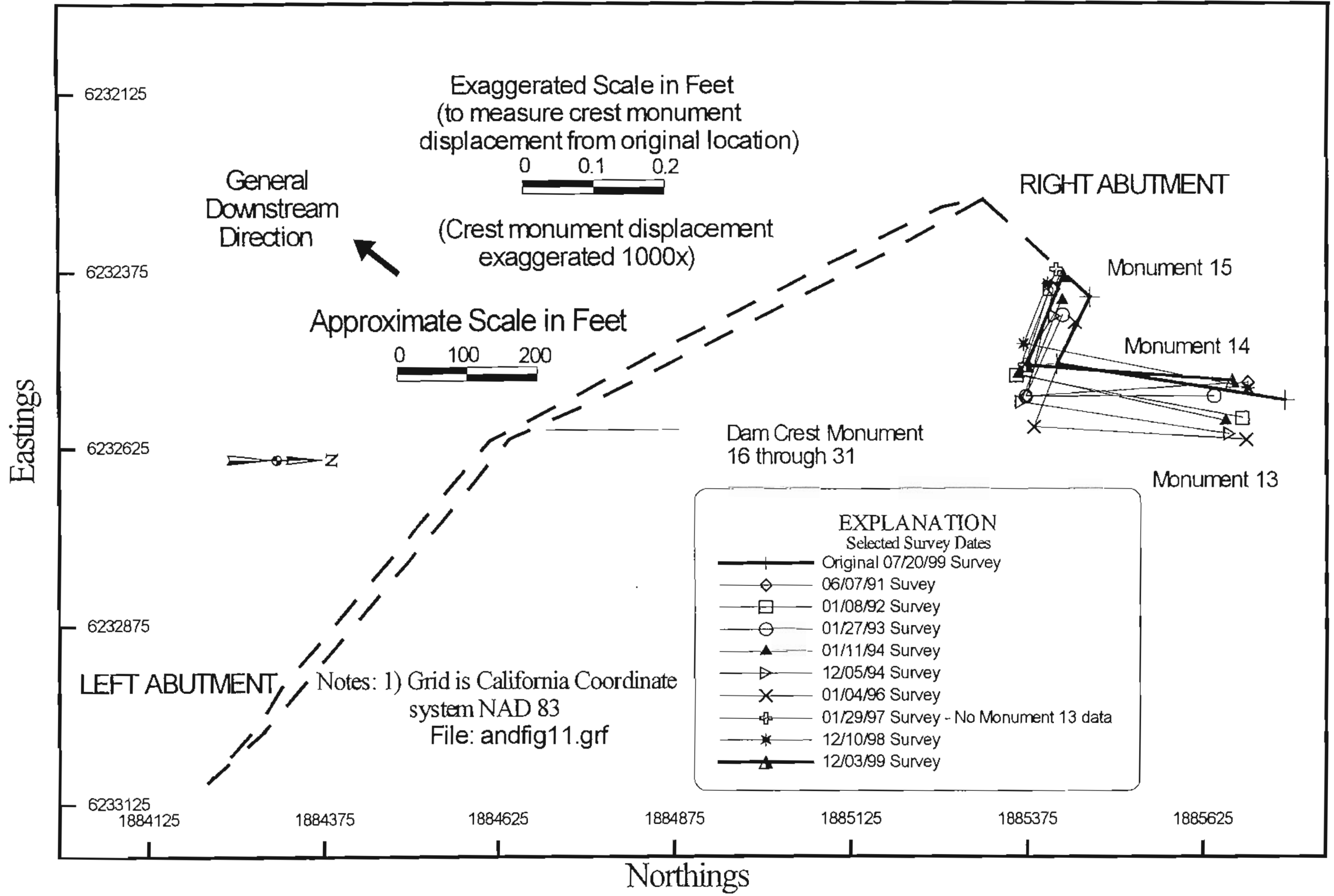


Figure 14. Spillway Training Wall Monument Lateral Location Surveys in Plan View, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District

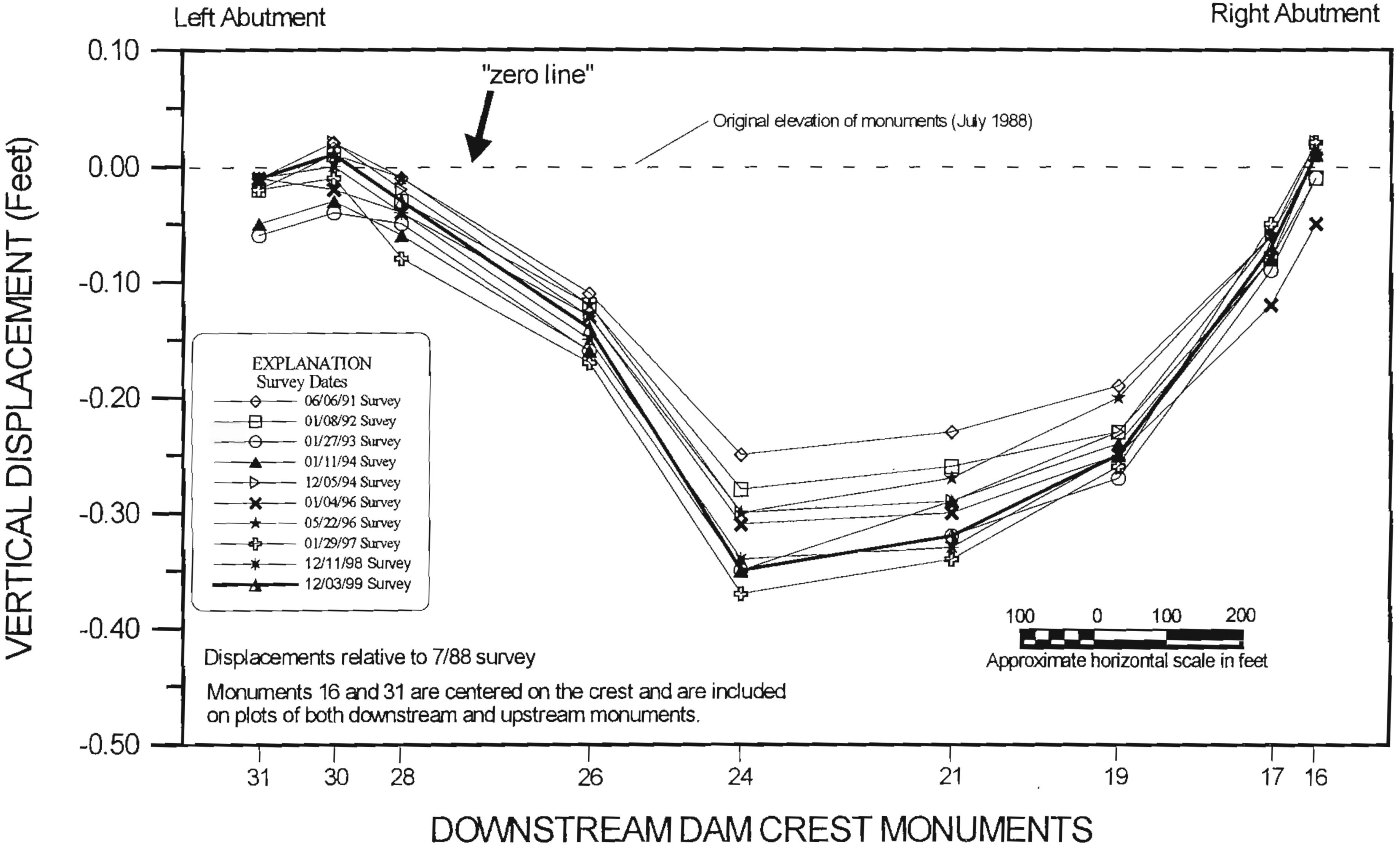


Figure 15. Downstream Crest Monument Vertical Location Surveys in Section View, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District

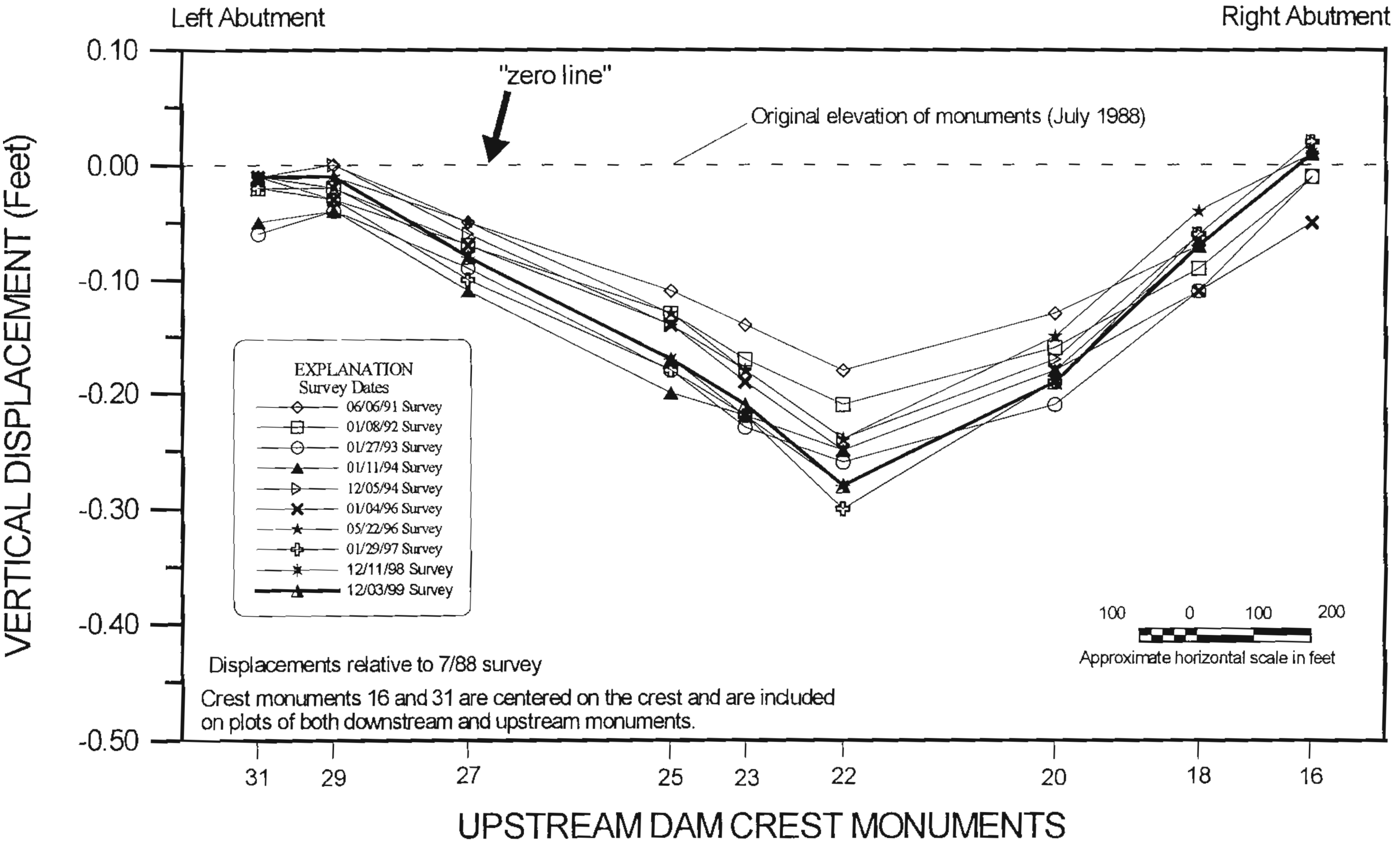


Figure 16. Upstream Crest Monument Vertical Location Surveys in Section View, July 1988 through December 1999

LEROY ANDERSON DAM (No. 72-9)

Santa Clara Valley Water District

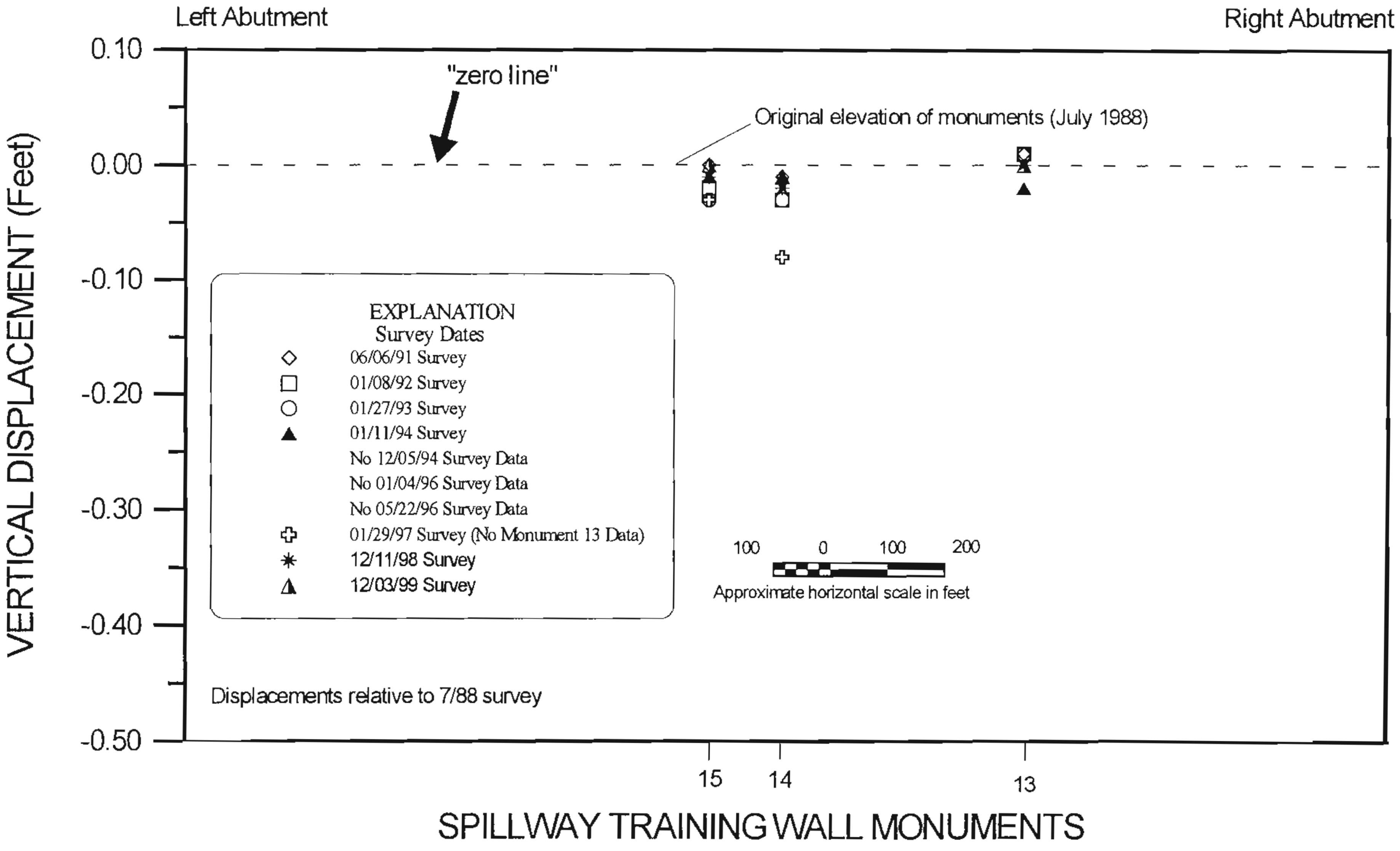


Figure 17. Spillway Training Wall Monument Vertical Location Surveys in Section View, July 1988 through December 1999